Annual Report of the Department of Agriculture in the Province of Bombay, 1943-44

BOMBAY
PRINTED AT THE GOVERNMENT CENTRAL PRESS
Obtainable from the Superintendent, Government Printing and Stationery, Bombay or through the High Commissioner for India, India House, Aldwych, London, W.C.2, or through any recognized Bookseller

Price—Annas 3 *or* 4*d*.

1945

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ANNUAL REPORT OF THE DEPARTMENT OF AGRICULTURE, BOMBAY PROVINCE, 1943-44.

CHAPTER I.

THE AGRICULTURAL YEAR, 1943-44.

CLIMATE AND RAINFALL.

(1) The agricultural season of 1943-44, taking the *kharif* and *rabi* seasons together, was, on the whole, fairly satisfactory and proved better than its predecessor. The regular monsoon commenced from the middle of June and the rainfall was satisfactory up to mid-August except in the south-eastern regions, where it proved to be inadequate, for timely cultural operations and for satisfactory crop germination. The precipitation late in July was particularly heavy in parts of North Gujarat and in certain localities in the North Konkan. Elsewhere in the Province, the general outlook for the *kharif* season was satisfactory. The activity of the *kharif* monsoon declined by the middle of August but deficiency in rainfall was not appreciable in Gujarat, the Konkan belt and the western regions of the Deccan and the Karnatak. Opportune rains in early September, along with the early October rains, facilitated *rabi* tillage and gave promise of a successful *rabi* season. Excessive rains towards the middle of October, however, had an adverse effect on standing and harvested *kharif* crops and caused some damage to the *rabi* seedlings in low lying situations, particularly in the Deccan. There were some eight showers of rain in the first fortnight of November in parts of the Karnatak and the southern areas of the Deccan and the Konkan and the condition of the standing crops was generally satisfactory, excepting in the south-eastern regions of the Deccan and the Karnatak. Climatic factors, such as cloudy dull weather, dry easterly winds, etc., later in the season affected crop growth, particularly on the lighter types of soil and especially in the south-eastern districts of the Province. The climatic conditions of the year were also favourable to increased rust attack on wheat which damaged this crop in many areas of the Province and resulted in reduced yields.

CROP STATISTICS.

(2) *Area.*—Taking all crops together, there was little alteration in the total area sown as compared with the preceding decennium. The area under rice showed a decrease of about 5·0 per cent. over last year but an increase of 1·8 per cent. over the decennial average. The area under wheat increased by 17·4 per cent. over last year, but remained still below the decennial average by about 10·0 per cent. The area under *bajri* decreased by 3·9 per cent. over last year but showed an increase of about 31·7 per cent. over the decennial average. The area under *jowar* increased by 2·8 per cent. over last year, but showed a decrease by about 4·7 per cent. over the decennial average.

The area under groundnut showed an increase of 7·8 per cent. and 9·5 per cent. over the last year and the decennial average, respectively. The cotton acreage increased only by 6·5 per cent. over the last year's acreage but decreased by 21·1 per cent. as compared with the average of the preceding decennium. The area under sugarcane increased by 9·4 per cent. and 34·9 per cent. over the last year's area and the decennial average, respectively.

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The table below gives the actual acreage in the Province under the more important crops in the year under report, i.e., 1943-44, the preceding year 1942-43 and the average acreage of the decennium 1932-33 so 1941-42 :—

No.	Name of the crop.	Acreage in the Bombay Province.		
		1943–44.	1942–43.	Average of decennium 1932–33 to 1941–42.
		Acres.	Acres.	Acres.
	Cereals.			
1	Rice	2,005,192	2,112,872	1,972,705
2	Wheat	1,562,296	1,329,413	1,735,248
3	*Jowar*	7,586,225	7,378,017	7,958,477
4	*Bajri*	5,077,176	5,283,044	3,854,104
	Fibres.			
5	Cotton	3,019,647	2,833,970	3,827,334
	Pulses.			
6	Gram	484,342	424,548	640,592
7	*Tur*	488,605	467,019	404,292
	Oilseeds.			
8	Groundnut	1,363,208	1,264,428	1,244,242
9	Sesamum	164,782	195,334	159,211
10	Linseed	68,329	56,299	120,499
11	Castorseed	56,452	48,857	47,836
	Miscellaneous.			
12	Sugarcane	116,111	105,655	86,386
13	Tobacco	104,175	127,785	164,711

(3) *Production.*—The total estimated production of all crops increased over the outturn of the last year. There was, however, a reduction in the outturn of rice as compared with the last year but the outturn under other cereals, pulses, fibres and oilseeds showed a general increase due to the satisfactory nature of the season as compared with the preceding year. The outturn of groundnut increased by 20·2 per cent. and 6·7 per cent., respectively, over last year's outturn and decennial average. The corresponding increase in the case of sugarcane (*gul*) is 12·1 per cent. and 84·6 per cent. respectively. There was, however, a reduction in the area under tobacco by 18·9 per cent. and 41·7 per cent., respectively. The outturn of cotton in bales increased by 22·8 per cent. over the last year but showed a reduction by 11·3 per cent. over the decennial average. The outturn of castorseed and linseed increased, by 11·9 per cent. and 59·8 per cent. respectively, over last year's outturn.

The table below gives the yields of more important crops in the Province in the year under report, i.e. 1943-44, the preceding year 1942-43 and the average yield of the decennium 1932-33 to 1941-42 :—

No.	Name of the crop.	Production of crops in the Bombay Province. 1943-44.	1942-43.	Average of decennium 1932-33 to 1941-42.
		Tons.	Tons.	Tons.
	Cereals.			
1	Rice	882,093	923,254	808,796
2	Wheat	270,139	238,621	308,182
3	*Jowar*	1,338,377	1,049,933	....
4	*Bajri*	638,625	625,506	474,625
	Fibres.	Bales. (400 lbs.)	Bales. (400 lbs).	Bales. (400 lbs.)
5	Cotton	629,581	512,890	709,453
	Pulses.			
6	Gram	79,601	66,698	99,211
7	*Tur*	131,201	102,586	99,591
	Oilseeds.			
8	Groundnut	559,789	465,533	524,767
9	Sesamum	19,742	22,440	18,113
10	Linseed	6,552	4,101	11,763
11	Castorseed	7,762	6,934	6,105
	Miscellaneous.			
12	Sugarcane (*gul*)	404,159	360,611	218,926
13	Tobacco	22,121	27,261	37,941

CROP PRICES.

(4) Economic factors due mainly to the War continued to influence the trend of prices of agricultural produce which, in general, ruled higher than those of the preceding year in spite of the favourable season during the year under report. The price index figure of cereals and pulses and other articles of food showed an upward trend as compared with the preceding year. Transport difficulties and shortage, operations by speculative elements, and the general uncertainty in the International situation have adversely affected agricultural prices. Consequently the intervention of Government in the direction of price control and organised distribution of many agricultural products continued during the year and was extended to almost all the important cities and towns in the Province. Detailed information regarding fluctuations in the prices of important agricultural commodities during the year under report is given in Chapter VI of the "Season and Crop Report, Bombay Province, 1943-44" and are not repeated in this Report.

AGRICULTURAL LEGISLATION.

(5) During the year under report, the Bombay Land Improvement Schemes Act, 1942 (Bombay Act No. XXVIII of 1942) was amended with a view to give greater powers to the Divisional Land Improvement Boards to make and enforce regulations regarding matters supplementary to the preparation and execution of land improvement schemes in the Province. The provisions of the amended Act were extended with a view to cover schemes subsidised by the Provincial Government or by any trust, to provide for the maintenance and repairs of works done pending preparation of the Record of Rights and to provide for execution of land improvement schemes at Government cost in the first instance and for the recovery of the land owner's share of the cost by annual equated instalments over a fixed period of years.

During the year under report, the Bombay Cotton Control Act, 1942 (Bombay Act No. XXX of 1942) was applied to the whole of the East Khandesh district. According to this legislation, the cultivation of the *jarila* variety of cotton only is permitted in the scheduled area and the growing of other varieties is prohibited.

The Bombay Growth of Food-crops Act, 1944 (Bombay Act No. VIII of 1944) was enacted to provide for regulating the cultivation of crops with a view to ensure more food crop production in the Bombay Province and to reduce the acreage under short stapled cotton which would not be easily marketable. The Act was extended to the whole of the Province, except the Konkan, Bulsar Taluka and Pardi Mahal (Surat District), Igatpuri Taluka and Peint Mahal (Nasik District), Maval Taluka (Poona District), Mahableshwar Peta (Satara District), Khanapur and Belgaum Talukas and Chandgad Mahal (Belgaum District) and Kalghatgi, Hangal and Kod Talukas (Dharwar District). Under section 3 of this Act, cultivators in certain scheduled parts of the Province, where the "Grow More Food" campaign had been reasonably effective and where the proportion of scheduled non-food to food-crops was reasonable, were required to grow scheduled non-food crops on an area not greater than that of the previous year (1943-44). Under section 4 of the Act, which was applied to areas where the proportion of scheduled non-food crops was found to be still excessive or where inferior short-stapled cotton was grown, cultivators were required to grow scheduled food-crops on an area of not less than two-thirds of their total holdings and were permitted to cultivate scheduled non-food crops on an area not exceeding $\frac{1}{6}$ of their holdings only. The remaining $\frac{1}{6}$ was available for any other crops (oil-seeds, condiments, etc.) which the cultivators might choose to grow.

CHAPTER II.

SOIL AND IRRIGATION RESEARCH.

(6) *Introduction.*—Research in various problems relating to the soil, conservation of soil moisture and the irrigation of crops forms an important part of the programme of work of the Sugarcane Research Station, Padegaon and its Sub-stations and of the Dry Farming Stations at Sholapur and Bijapur. The former centre deals mainly with research work on the physical and chemical constitution of different genetic soil types in relation to irrigated crop production, mainly sugarcane, and with physiological problems connected with irrigated crop cultivation. The work at the Dry Farming Stations includes scientific investigations into improved methods of tillage, land management and crop production in the "Scarcity" areas of the Bombay-Deccan which are most liable to failure or shortage of rainfall. Both the schemes in operation at these Stations were originally substantially assisted

financially by the Imperial Council of Agricultural Research under whose auspices the work was started. These schemes sanctioned by the Council have now terminated, the Dry Farming Scheme at Sholapur and Bijapur finishing on 30th June, 1943 and the Sugarcane Research Scheme, Padegaon on 30th June, 1944. Scientific work on dry farming problems is being continued at Sholapur by the Soil Physicist to the Government of Bombay, while, on the termination of the Sugarcane Research Scheme, Padegaon, the Padegaon Station has been converted into an Agricultural Research Station, Deccan Canals, for detailed investigations into all agricultural problems of the Deccan irrigated tracts including fruit growing, mixed farming, livestock breeding, etc. This Station will also serve as a centre for the widespread demonstration and extension of the results of successful research work in canal irrigated areas.

A. THE BOMBAY-DECCAN SUGARCANE RESEARCH SCHEME, PADEGAON.

(7) During the year under report, this Scheme completed its twelfth and final year of working. In the Soil Physics Section, the results of the soil survey of the Girna Canal have established an inter-genetic relationship between two very important soil types occurring in this tract. Pot culture studies have revealed a definite deficiency of phosphate in the soil from unmanured plots grown continuously under cane while the soil from manured cane plots has been found to be sufficiently supplied with all the major plant food ingredients. Investigations on periodic fluctuations in plant nutrients in six genetic soil types in lysimeters and the quantitative determinations of soil tilth after various rotational crops at the substations have yielded valuable results which will be of practical utility in fixing suitable crop rotations for different soil types. Further studies in soil genetics of typical alkali soil profiles were carried out with a view to classify them into sub-types having definite soil properties bearing on agricultural practices.

In the Section devoted to the study of problems connected with crop physiology, detailed investigations into the influence of climate and humidity on crop growth, borer attack on sugarcane etc. were continued and useful data were obtained. The high sucrose content at the maturity period of cane has been found to be due more to the leaching down of nutrients by the excessive rains of October than to other climatic factors. Pot culture studies have definitely proved that, from the standpoint of irrigational requirement of the cane crop, it is advantageous to maintain the water table at a depth of about 4 feet from the surface. The value of rain water as compared with canal water in enhancing cane yields has been definitely confirmed. Suitable irrigational intervals for cane grown on shallow, medium and deep soils have been worked out. Bio-chemical work in mineral nutrition has definitely proved the advantage of organic phosphate as against inorganic phosphate manuring. Experimental work on the mineral nutrition of Adsali (July) cane and preseasonal plantings was continued in order to devise a suitable manurial technique for these important types of cane cultivation. Lysimeter studies have shown a better response of the crops on various soil types to phosphate manuring when green manured with *Sann* than when manured with farm yard manure.

In the Agricultural Management Section, cane varietal trials were continued and, in addition, large scale complex field experiments were laid out to determine the optimum irrigational intervals along with the relative value of compost, oil cakes and inorganic manures in increasing cane yields and sucrose content. The necessity of a basal dose of organic manure, e.g., compost, to obtain the best results from the use of artificial fertilisers in top-dressing has been clearly brought out. Interesting results have been also obtained in experiments dealing with the continuous application of phosphate to the cane crop. Among the varieties under trial, Co. 454, which has been found to be superior to Co. 419, is now release for further trial on

factory estates. A leaflet containing a schedule of instructions for all improved methods of cane cultivation based upon the results obtained during the period of the Sugarcane Research Scheme has been prepared for distribution and propaganda among sugarcane growers.

(8) *Sub-Stations under the Sugarcane Research Scheme, Bombay-Deccan.*—The main work at the five Sub-stations under the Sugarcane Research Scheme which have been established in the Deccan Canal Tract at Lakhmapur, Deolali, Akluj, Hol and Kopergaon, is to test out, on the different major soil types found in the canal areas, the results of the successful research work carried out at the Central Research Station at Padegaon. The Sub-station at Hol is also being utilised to investigate the effect of different systems of cropping, irrigation, manuring, etc., in the reduction of soil alkalinity. A rotation of rice and sugarcane, with preseasonal cane plantings, has, so far, been found to be promising in this connection. At the other Sub-stations, valuable data in connection with the fertility status of different soil types are being collected and will be utilised to evolve suitable manurial and irrigational technique applicable to respective genetic soil types. These Sub-stations will now be financed by the Bombay Government as Sub-stations under the newly established Agricultural Research Station, Deccan Canals, on the termination of the Sugarcane Research Scheme subsidized by the Imperial Council of Agricultural Research at Padegaon.

(9) *Genetic Soil Survey Scheme.*—The year under report was the concluding year of this scheme, which was sanctioned from 17th June, 1942 to 31st March, 1944 and financed by a grant from the Sugar Excise Fund. Under this scheme, the survey and classification of land on a scientific basis was undertaken as a commercial project and on a self-supporting basis on two sugar factory estates, viz. the Belapur Sugar Co. Ltd., Harigaon, and the Kalam Sugar Factory at Walchandnagar. The survey of the stipulated area of 17,832 acres was completed during the period of the scheme. The chemical analyses of soil samples and the preparation of final maps showing the different soil types and the variations in certain fertility factors bearing on cane cultivation were also completed for these areas. Six district genetic soil types have been found to occur in varying extents on each of the factory estates. The scheme has now been extended for a further period of 3½ years for the similar detailed survey of cane lands on five other factory estates covering a total area of about 35,000 acres.

B. DRY FARMING INVESTIGATIONS AT SHOLAPUR AND BIJAPUR.

(10) On the termination of the Dry Farming Research Scheme at Sholapur, which was subsidized by the Imperial Council of Agricultural Research up to June, 1943, further scientific work relating to dry farming problems in the "scarcity" areas of the Bombay-Deccan has been undertaken by Government and is financed from provincial revenues.

At Sholapur, the rainfall during the year totalled 34·97 inches which was 32 per cent. higher than the average. However, due to the uneven distribution of the rains, the season was most unfavourable for both *kharif* and *rabi* crops. The long dry spell during the months of July and August after the sowing of *kharif* crops, the excessive precipitation in October soon after the sowing of *rabi* crops and the complete absence of rain during December, which is the maximum growing period for *jowar*, were the main adverse features of the season in this tract. At Bijapur, the rainfall amounted to 26·11 inches which was about normal. Here, the distribution was fairly good for *kharif* crops but defective for *rabi* crops due to absence of rain throughout the winter months. As in the previous year under such adverse seasonal conditions, the improved method of cultivation known as the "Bombay Dry Farming Method" definitely proved its superiority over the local cultivators' method. In Sholapur and Bijapur, respectively, the *jowar*

crop grown under the improved system of cultivation yielded 140 lbs. and 255 lbs. of grain per acre in comparison with 92 lbs. and 183 lbs. of grain per acre on similar areas cultivated according to the common local practices. There was, however, no appreciable difference in the yields of *jowar* fodder at both places. In spite of the low yields obtained this season, the scientific dry farming method gave a net profit of Rs. 2-6-3 per acre as against Rs. 0-0-9 per acre under the local practices of tillage at Sholapur. During the year under report, the runoff and erosion resisting capacities of different crops were studied in controlled runoff plots for the first time at Sholapur. The utility of growing crops like *matki*, *hulga* and groundnut in controlling runoff and erosion has been brought out prominently in the course of this experiment. In addition, studies of soil moisture determinations under different systems of cropping, evaporation of soil moisture from pots of varying depths and investigations into the nature and extent of *murum*-decomposition were continued. Replicated trials, conducted on modern statistical design, have shown the importance of applying farm yard manure in the deep black soils of Bijapur and of *sann* green manuring in the light shallow soils of Sholapur. The combined system of "contour cultivation and strip-cropping" was continued as in the last year with promising results. This technique has not only shown its effectiveness in controlling runoff and erosion but has also given upto double the yield of *bajri* and *tur* in comparison with the same crops grown under the local tillage practices.

(11) *Sub-stations under the Dry Farming Research Station, Sholapur.*—The total rainfall at the two sub-stations of Jeur in Sholapur district and Chas in Admednagar district, which were established in 1941-42 in order to test out the efficacy of the Bombay Dry Farming method under different soil and climatic factors, was 18·33 and 25·37 inches, respectively. The distribution of the rainfall at both these centres was very similar and unfavourable for *kharif* as well as for *rabi* crops, particularly the latter. As a result, the improved dry farming method of cultivation was again subjected to a severe test this year in both areas and the results obtained were highly encouraging. At Jeur, the outturn of rabi *jowar* was 317 lbs. of grain and 370 lbs. of *kadbi* per acre on the area cultivated according to the improved method in comparison with 80 lbs. of grain and 112 lbs. of *kadbi* per acre obtained on areas farmed in accordance with local practices. Similarly at Chas, the yields under the scientific dry farming method were 190 lbs. of grain and 393 lbs. of *kadbi* per acre as against 47 lbs. of grain and 143 lbs. of *kadbi* under the local method of cultivation. It is very gratifying to note that the villagers round about these sub-stations are taking a keen interest in their work and, after frequent visits, are adopting gradually the improved methods of cultivation demonstrated at the sub-stations in their own fields.

CHAPTER III.

BOTANICAL RESEARCH.

(12) *Introduction.*—As a measure toward the improvement of the main cultivated crops of the Province from the dual standpoints of outturn and quality, botanical research forms one of the most important activities of the Agricultural Department and is conducted at numerous Government Farms and research stations throughout the Province. As a result of this work, considerable success has already been achieved in the evolution of improved varieties of cotton, wheat, rice, tobacco, oil-seeds and pulses. Many of these improved varieties have been extended widely in the districts through organised seed multiplication schemes. The additional profit which the results of such scientific work brings to the cultivators is now highly appreciated by them. Moreover, the introduction and expansion of high yielding varieties of food crops has assisted appreciably in enabling the Province to tide over the present critical situation by increasing food grain production resources in the districts.

(13) *Departmental Plant Breeding Committee.*—This Committee has been functioning for four years, and continues to prove of much value in the organization and supervision of the work of botanical research on all kinds of crops throughout the Province. The Committee considers reports of Divisional Plant Breeding Committee meetings and examines the results of field trials of improved crops, both on Government Farms and in the districts. The Director of Agriculture is the Chairman of the Committee and the Economic Botanist to Government and the Deputy Director of Agriculture, Crop Research, are its members. During the year, the Committee met four times and dealt with a variety of technical subjects dealing with scientific crop improvement in the Province.

A. Cotton.

(14) *Gujarat.—Cotton Breeding Work at Surat.*—This work has for its main object the evolution of an improved variety of cotton which will possess the highly valued fibre properties of the existing improved type, *i.e.*, 1027 A. L. F., but which will be superior to it both in yield and in ginning percentage. This object has not as yet been completely achieved. The improved strain Suyog is, however, a near approach to the desired variety and has been proved to be more profitable to the cultivators than 1027 A. L. F. on account of its high ginning percentage and its degree of wilt resistance. Accordingly, this new improved variety is being extended in the Surat area to replace 1027 A. L. F. as the standard improved cotton for that tract. Further botanical work is in progress on hybridization and detailed testing of such synthetic types which show an improvement over "Suyog" in fibre qualities and early maturity.

(15) *Gujarat.—Cotton Breeding Scheme, Broach.*—This scheme, which is subsidised by the Indian Central Cotton Committee, completed its eleventh year of working with the year under report. As a result of the scientific work done during this period, an improved type of cotton, superior to both Broach local and B. D. 8 in ginning and quality of fibre, has been evolved. The name "Vijaya" has been given to this improved variety which is now being extended in the district through an organised seed multiplication and distribution scheme also subsidised by the Indian Central Cotton Committee. Further work is in progress with the objects of securing a still better staple length in "Vijaya" by hybridisation with 1027 A. L. F. and of breeding early maturing types.

(16) *Gujarat.—Wagad Cotton Breeding Scheme, Viramgam.*—This scheme, which has been partly financed by the Indian Central Cotton Committee since May, 1937, aims mainly at evolving improved strains of cotton, particularly with regard to yield, quality and early maturity, for extension in the Dholleras-Wagad Cotton growing area. This tract comprises 13 lakhs of acres and is liable to periodic failures of rainfall and to frost damage. Long stapled, silky and close-bolled types of Iran, Surtee-Broach types and early cottons from Russia have been extensively used in crossing with suitable Wagad types. As a result of this work, several promising types have been evolved of which the strain K-72-2 is found to be outstanding. While equal in yield in *kapas* to Wagotar (Segregate 4-1), it is superior to it in fibre qualities. Work is now in progress to improve the staple length and "feel" of this cotton by further hybridization with Iranian cottons.

(17) *Gujarat—Kaira Cotton Breeding Scheme, Anand.*—This scheme, which is also financed by the Indian Central Cotton Committee, has, as its objective, the production of a superior type of cotton to replace the low ginning and inferior stapled perennial Rozi Cotton grown over 10,000 acres in the *goradu* soils of middle Gujarat. Study of promising selections from Rozi and other cottons was continued during the year. Trials of "Vijaya" are also in progress to determine its suitability in preference to "Rozi" in the areas concerned.

(18) *Gujarat.—Scheme for Research in Interspecific Hybridizations of Cotton, Surat.*—This scheme has been financed by the Indian Central Cotton Committee with the object of investigating the possibilities of cotton improvement by interspecific hybridization between American and Asiatic cottons. When hybrids between these two species of cotton are obtained, they generally prove self-sterile but fertility has been induced by back-crossing to American cottons and by treatment with colchicine. Yield trials of advanced stage cultures of such back-crosses at Surat showed that, though none of them was superior to 1027 A.L.F., some were equal to Co. 2, the American variety which thrives well under Surat conditions. Further, some of these cultures have shown a good combination of ginning percentage and staple length. The promising material obtained on a result of work being done under this Scheme is also being tried at other cotton breeding stations in India. Additional material is being created by suitable crosses in order to secure better and more useful material for future work.

(19) *Khandesh.—Jalgaon Cotton Breeding Scheme.*—The Indian Central Cotton Committee has extended this scheme for a further period of five years and the year under report is the second year of the extension period. The scheme aims at evolving a strain of cotton which will be superior to "Jarila" in ginning percentage and, at the same time, will not be in any way inferior to that well known variety in yield, staple length and wilt resistance. Seven cultures from the cross between Jarila × N. R. 5 continue to give superior ginning percentage to that of Jarila and have also proved in no way inferior to it in other economic factors. Promising plants from the first generation of the back-cross (N. R. 5 × Jarila) × Jarila have been obtained for further study. The cultures from Dokras cotton have proved to be low yielders and will therefore be discontinued.

(20) *Southern Division.—Cotton Breeding Work at Dharwar and Gadag.*—The botanical work on cotton improvement at Dharwar and Gadag is designed to evolve strains of Kumta and Dharwar-American cottons which will be an advance on the present improved standard varieties, viz. Jaywant and Gadag-1, in their economic characters and which, as a result, would bring more profit to the cotton growers of the Southern Division. At Dharwar, certain very promising segregates, obtained as a result of hybridization work when subjected to controlled field tests in the districts for the first time, showed distinct superiority in yield, ginning outturn and staple qualities to the standard improved varieties. Two synthetic types evolved at Gadag from the cross (Gadag-1 × Co. 2) are now under trial in cultivators' fields. This hybridization work is being continued both at Dharwar and at Gadag.

(21) *Poona.—Scheme for Breeding Wilt Immune Varieties of Cotton.*—This scheme, which is financed by the Indian Central Cotton Committee, is now in its seventh year. None of the cultures of Segregates 1-2 and 1-6, collectively known as "Vijaya" cotton, is still completely wilt immune but, in one culture of Segregate 1-2, the progenies of some of the plants did not show any mortality from wilt. The mode of inheritance of resistance to wilt in *Gossypium arboreum* var. *neglectum* has now been fully investigated and the results obtained from F_3 families of the cross (Dhulia 2 × Chinese R_1 57) show that the character of wilt resistance in this cotton involves three complementary factors.

Similar work on the breeding of wilt-resistant cottons being done at Shera shows that there is a good prospect of obtaining desirable material combining high wilt resistance and the agricultural characters of 1027 A.L.F. and Seg. 8-1. Promising material of other crosses is also under study.

(22) *Deccan.—Trials of Long Stapled Cotton Cultivation in the Deccan Canal Tract.*—Trials of long stapled cotton varieties, obtained from Sind, the Punjab, Madras and other cotton growing tracts, were continued under irrigated conditions at the

Sugarcane Research Station, Padegaon, and at its five Sub-stations in the Deccan Canal Tract. The varieties M-4 from Sind, L. S. S. from Punjab and Co. 3, Co. 4 and 4463 from Madras have shown promise. Almost all the American varieties are found, however, to suffer from " red leaf blight ", those from Northern India being worst in this respect. Among trials of sowing date experiments, early planting, *i.e.*, mid-April, has been found to be of advantage.

B. Rice.

(23) *Deccan.—Rice Breeding Work at Karjat and Sub-stations at* (*a*) *Vadgaon,* (*b*) *Igatpuri and* (*c*) *Panvel.*—The Rice Breeding Station at Karjat and its three Sub-stations deal with the improvement of the rice crop covering an area of about 9 lakh acres in Thana, Kolaba, Poona, Satara, Nasik and Ahmednagar districts. At Karjat, considerable progress has been made in the improvement of the major rice varieties of Thana and Kolaba districts and, as a result, promising strains of early and mid-late varieties are available and are being extended in these districts. Of these, a synthetic late Kolamba strain has proved quite outstanding, as it combines the high yield of Chibber Kolamba (K-42) and the lustrous character of grain of Z-149. High yielding strains in Ambemohor, Kamod, Kolpi and other local rice varieties of Poona, Nasik and Ahmednagar districts have been evolved at Vadgaon and Igatpuri Sub-stations. These strains will be put under large scale trials from next year. Scientific work has also been started during the year at Panwel in Kolaba district on the improvement of salt-land paddies. In order to enable a larger quantity of nucleus seed of the improved strains to be obtained as basis for multiplication schemes in the districts, additional land has been taken up at various rice breeding stations in the Province.

(24) *Konkan.—Rice Breeding Work at Ratnagiri and Kumta Government Farms.*—During the year under report, further selection work in the local rice varieties of the Karwar-Ankola zone to obtain high yielding strains was continued and a fresh collection of bulk samples was grown. Useful information has been obtained by comparative studies of the Kumta-Mugad crosses. A large quantity of pedigree seed of approved improved strains has been raised on these two farms for further multiplication and extension in the Konkan areas.

(25) *Southern Maratha Country.—Rice Breeding Work at Mugad.*—This station has been serving the needs of the Kannada rice-growing districts which cover approximately 23 lakhs of acres. As a result of the work done during the last 20 years, four improved strains of Mugad and three of Antarsal have already been issued and cover a major area in this tract. During the year under report, a new selection, D-622 from an early variety, Dodgya, has been finally released for general cultivation. The work on the improvement of local fine rice has resulted in the selection of some promising strains in early, mid-late and late varieties and two good early strains Waner-1 and 26-2 are under district trials. Promising purple-leaved synthetic strains are under further purification and comparative trials. These strains, when available, will facilitate the rogueing out and eradication of the wild rice plants which infest the rice growing areas in this tract. During the year, about 10 acres of land has been added to the farm for increased production of nucleus seed but more expansion will be necessary to meet requirements of district seed multiplication and distribution schemes which are to be put into effect at once.

C. Wheat.

(26) *Wheat Breeding Work at Niphad.*—The Cereal Breeding Station, Niphad, is the only centre in the Province at which investigations on the genetic improvement of the wheat crop are in progress. Strains evolved at this Station have done well practically all over the Province. The Jaya wheat (Bansipalli-808) has proved its superiority in the Karnatak especially during this year when there was heavy rust damage to the wheat crop in the Southern Division. The organization of the seed

supply of this wheat in the Karnatak with a view to spread it over a lac of acres is now being undertaken. The Vijay variety, (Niphad-81) continues to do very well in Nasik and Ahmednagar districts. Even with the increased area for seed multiplication at the Cereal Breeding Station, Niphad, last year, it has not been possible to meet to the full the increased demand for seed of this strain. Among irrigated wheats, Niphad-4 has been found to be one of the best quality wheats in India and has done very well in the Kaira district of Gujarat where it is rapidly replacing Pusa-52. This improved variety is also found to be much less susceptible to rust than Pusa-4. Large scale multiplication of this wheat is being taken up at the Dohad Farm. During this year, wheat breeding work for the Karnatak areas has been started at the Crop Breeding Station, Bijapur. A scheme for a Research Station for wheat improvement in the Bhal tract of Gujarat has also been sanctioned and a site has been selected at Arnej in the Ahmedabad district.

D. Other Cereals.

(27) (*a*) *Bajri*.—At the Cereal Breeding Station, Niphad, trials of improved strains of *bajri* were continued. The results have shown the superiority of three improved strains, N-3839, N-2815 and Af-3, over all the local varieties. It is now proposed to undertake large scale trials of these improved strains in the districts. Certain combinations, obtained by crosses between inbred strains and top crosses, have given very high yields and are still under replicated yield trials for the third year.

The improved variety, B-207, evolved at the Cereal Breeding Station, Niphad, has continued to maintain its superiority over local types. The seed of this variety is being multiplied in summer in order to prevent cross fertilisation and to obtain pure seed for large scale extension of this strain in the districts. Further work is in progress to improve the grain size and yield by crossing this strain with Bhavnagar and Baroda types.

(*b*) *Jowar*.—Genetic improvement of this most important cereal has been taken up at the Dry Farming Stations, Sholapur and Bijapur, under the technical guidance of the Deputy Director of Agriculture, Crop Research. Comparison of M-35-1 and M-47-3, the two improved Maldandi strains, in large scale field trials have shown the former to be better in yield and about a week earlier in ripening. Under irrigated conditions, M-47-3 has done well in the Deccan areas. M-35-1 has been crossed with a number of earlier maturing *jowar* varieties, obtained from various tracts of India, with a view to produce a synthetic type better in yield and quality than the original parent strain.

(*c*) *Maize*.—During the year under report, F_1 crosses of various improved strains were tested under random replications at the Government Farm, Arbhavi, where breeding work on this crop has been in progress for the last few years. Out of 26 combinations 12 have given higher yields than the local, the increase ranging from 25 to 80 per cent.

(*d*) *Small Millets*.—The work of the genetic improvement of Nagli (Ragi) is in progress at Hatkhamba in Ratnagiri district and at Igatpuri in Nasik district and a few improved strains are now available for further trials at the latter centre. Improvement work on Kodra has been taken up at Nadiad.

E. Tobacco.

(28) The area under tobacco in the Province is approximately two lakh acres, mainly concentrated in the Kaira district of Gujarat and in the Belgaum district of the Karnatak. Genetic improvement of the crop is being done at the Tobacco Breeding Stations at Saundalga near Nipani in the Belgaum district and at Nadiad in the Kaira district.

(*a*) *Nipani.*—Selection work in the local *bidi* tobacco has resulted in 10 promising cultures being obtained of which 20–2 and 112 have shown an outstanding performance. These have shown distinct superiority over the local types both in yield and quality. They will now be released for general cultivation. Among cigarette varieties, Harrison Special continues to do well in both yield and quality of cured product. In order to improve further this variety for colour and texture of cured leaf, it has been crossed with Bonanza and White-Burley which are superior in these characters but are inferior in yield to Harrison Special.

(*b*) *Nadiad.*—Of the two improved strains from Saijpuriu varieties, S-57 and S-98, the former has proved definitely better. During the year, work on the Piliu variety of tobacco which covers about 8,000 acres has been commenced. Studies of various tobacco crosses have been continued a stage further and two combinations K-4 × S-57 and K-49 × N-1-5 have given 25 per cent. higher yield than the improved parents.

F. Other Crops.

(29) *Oil-seeds.*—Work on the genetic improvement of the linseed crop has now been amalgamated with similar work on sesamum, niger and safflower under a scheme financed by the Sir Sassoon David Trust Fund. The area under linseed has decreased from 1,25,000 acres to 65,000 acres due to the fall in exports to the British Isles and Europe. It is, however, anticipated that a return to normal times will again increase the acreage under this crop to its pre-war level. Of the two improved strains of linseed, viz., No. 10 and No. 36, a scheme for the multiplication and spread of the former in Nasik district has entered its second year. It is proposed to cover the entire area under linseed in Nasik district with pure seed of the improved type at the end of three years. Further progress has been made in fixing the promising hybrid types from inter and intravarietal crosses. The work of selection of superior types for the Karnatak area has reached the replicated yield trial stage. In sesamum, improvement by the straight selection method and by hybridization have both yielded promising results. The improved strains yield 15 per cent. over the local material and, in addition, possess other desirable qualities. Similar work in safflower and niger crops has resulted in the selection of high yielding types with a higher oil content than the local material. District trials are being arranged to test the superiority of the strains evolved under cultivators' conditions.

(30) *Gram.*—Gram is one of the most important pulse crops in the Province and covers an area of nearly 6 lacs of acres. An exceptionally good quality, yet high yielding strain, Chafa, which has been evolved at the Cereal Breeding Station, Niphad, possesses a bold yellow grain and is quicker growing than the local varieties in the Deccan and Konkan. It has also proved to be superior in yield and quality than the Dharwar improved strain 18–12 in Sholapur, Bijapur, Dharwar and Belgaum districts. This variety is now being grown extensively in the Deccan and Karnatak districts. A new quality strain with round grains and orange coloured seed-coat has been evolved at the Cereal Breeding Station, Niphad, and will be released for district trials next year. This variety was evolved especially for use in parching.

(31) *Tur.*—Work on this important pulse crop has also been in progress for several years at the Cereal Breeding Station, Niphad. Three new improved strains, better than the original improved type T–84, are now available and are being multiplied for district trials.

(32) *Other pulses—Scheme for Botanical Research Work on the Improvement of Pulse Crops in the Bombay Province.*—This scheme, which is financed jointly by Government and the Imperial Council of Agricultural Research, is now in its third

year. The work is under the direction of the Economic Botanist to Government and is being carried out on *mug* and *udid* at Jalgaon, on *matki* at Poona, on *gram* and *kulthi* at Dharwar and on *tur* at Arbhavi. The work of selecting superior types from local material in each of these six pulses has yielded good results. In all the pulses, single plant selections have yielded strains which possess desirable commercial and economic characters and replicated yield trials of some of the best strains among the selections have been in progress. Selection work for wilt resistant strains in gram and *tur* is showing some promise although the work on wilt resistance is difficult.

(33) *Potatoes*.—Experiments on the relation between the size of seed tubers and the resultant yields show that the outturn from the use of seed potatoes weighing 1 oz. was significantly more than when seed potatoes weighing ½ oz. and ¼ oz. were planted. In the case of seed tubers weighing 1 oz., there was no difference in the final yield whether these tubers were planted whole or cut before planting.

(34) *Agave (Sisal)*.—Experimental work on trials of different varieties of Agave was continued at the Government Farms at Poona, Dohad, Dharwar and Kumta. The best growth has been observed at Dharwar where the leaves are ready for fibre extraction. At Poona the plants have failed to grow on poor land, i.e., *mal* land. The yield of fibre in relation to soil and climate will be determined later when the crops have made sufficient growth at these experiment centres.

A scheme for the development of the sisal industry at Shrigonda, District Ahmednagar, has been sanctioned for a period of three years in the first instance and the year under report was the first year of the working of the scheme. The work under the scheme falls under two main heads, viz., agricultural and industrial. The agricultural side, which includes (*a*) reconditioning of the existing estate which is in a derelict condition by planting new rows and filling up gaps, (*b*) harvesting the leaves and (*c*) establishment of selection plot and nursery, is supervised by the Economic Botanist to Government and the industrial aspect, which comprises extraction of fibre and its marketing, is under the control of the Director of Industries.

(35) *Pyrethrum*.—Experimental work on the introduction of this plant in the Bombay Province has been started by the Economic Botanist to Government during the year under report. Attempts made to establish Poona grown seedlings at Anjanneri near Nasik without irrigation have so far failed. Efforts are also being made to grow Pyrethrum at Panchgani (4,000 feet elevation) and at Donja near Sinhgad (1,800 feet above sea level).

(36) *Cryptostegia Grandiflora*.—Small plots of this rubber plant under dry, semi-dry and irrigated conditions have been successfully established. The plants, however, have not yet been tapped for rubber.

G. Grazing and Fodder Crops.

(37) Experimental work on the growth and feeding value of Giant Star Grass has been continued at Poona. It has been found to continue growth on medium and rich soils for at least four years under rain fed conditions. The aerial parts wither in the dry season following cessation of rains but the grass perenniates by underground parts. The plants die on poor soil. As regards its feeding value, though well fed cattle do not relish the grass, cultivators' animals consume it readily. Animals at rest, fed for about a week, exclusively on Giant Star Grass are not found to lose weight.

(38) *Provincial Fodder and Grazing Committee*.—No meeting of this Committee was held during the year under report.

CHAPTER IV.

Crop Protection.

(39) *Introduction.*—The annual damage caused by plant diseases and insect pest to field crops in the Province is immense and the evolution of suitable measures for crop protection is one of the main functions of the Plant Pathological and Entomological Sections of the Agricultural Department. While, as a result of past scientific research work, effective and economic measures for the prevention and control of many of the most important crop pests and diseases are available, the organization for the timely notification of the occurrence of these insect pests or plant diseases on crops and for the prompt and effective application of adequate control and remedial measures on the affected area is not yet sufficiently developed in the districts. Some progress in this direction has been made in recent years. Such an organization will be, however, required on a very extensive scale and will, undoubtedly, return large dividends on the expenditure incurred for its establishment and working in increased agricultural production.

(40) *Departmental Insect Pest and Plant Disease Committee.*—This departmental committee held three meetings during the year under report, and dealt with a large number of subjects connected with scientific research work on the prevention and control of insect pests and plant diseases, and the organisation of effective control measures in the districts.

A. Research Work.

(41) *Against crop diseases.*—The Plant Pathologist to Government continued to carry out a comprehensive programme of scientific investigations into the prevention and control of a large and varied number of plant diseases affecting all types of cultivated crops in the Province. A major part of such work is being done under schemes financed or subsidised by the Imperial Council of Agricultural Research, the Indian Central Cotton Committee, etc. Other work is met by expenditure from departmental grants. The Economic Botanist to Government is carrying out similar work dealing with the control of "Striga" attack on *jowar* and "Orobanche" attack on tobacco crop.

(42) *Plant Virus Research Scheme.*—This scheme, which is financed by the Imperial Council of Agricultural Research, has as its objective the study of the fundamental nature of plant viruses and of virus diseases in plants. During the year under report, several investigations into the relation of viruses to their insect vectors were carried out. Valuable information on the movement of the virus in the plant has been obtained and many new virus diseases of plants have been discovered. The Imperial Council of Agricultural Research has now decided to establish a Virus Disease Research School at the Agricultural College, Poona, where all problems relating to plant viruses will be investigated and where young workers from all over the country will be trained in the technique of virus disease investigation.

(43) *Wheat Rust Research Scheme.*—The main object of this scheme is to test the reactions of different strains of wheat to black rust. The work is done at Mahableshwar under the supervision of the Plant Pathologist to Government. This research forms a part of a co-ordinated all-India scheme of investigation on rust diseases of wheat and is subsidised by the Imperial Council of Agricultural Research. Tests made in the glasshouses at Mahableshwar showed that E.144, a Kenya wheat, reported to be resistant at the seedling stage to rust races 15 and 40, proved highly susceptible to all races of black rust except race 75, when the tests were carried out during April and May under favourable conditions of light and temperature. Another wheat variety, viz., Holfed 1 from New South

Wales proved resistant to all races of black rust. In an experiment to determine the effect of rust on the quality of grain produced by improved strains of wheat, as determined by shrivelling of the grain, the effect of rust attack was most severe on Bansi 168 and Niphad 81, but was less marked on Niphad 4 and Baxi 165-6.

(44) *Scheme for Research on the Citrus Die-back disease in Peninsular India.*—This scheme, which has been sanctioned by the Imperial Council of Agricultural Research for a period of three years, provides for the survey of Citrus "die-back" disease in Bombay, Hyderabad and Mysore. The headquarters of the scheme is in Poona, and the work, started in the year under report, is placed under the supervision of the Plant Pathologist to Government. The scheme is financed jointly by the Imperial Council of Agricultural Research and the Government of Bombay, Mysore and Hyderabad. The results of the survey so far carried out in Bombay Province, Mysore and Hyderabad show that, what is termed in general as "die-back" disease, may be tentatively classified as sudden wilt, decline, yellowing, twig gumming and die-back. Die-back was found to be common in light, shallow soils, but no correlation seemed to exist between soil conditions and the occurrence of the other diseases. Cultural operations did not seem to have any effect on the incidence of the diseases. A species of *Fusarium* was isolated from the roots of affected plants.

(45) *Scheme for investigation into 'small leaf' disease of cotton.*—This scheme, also under the supervision of the Plant Pathologist to Government, has been financed by the Indian Central Cotton Committee with a view to determine the nature of 'small leaf' disease, which causes reduction in size of leaves and sterility in Rozi cotton grown in Kaira district, and in Mungari cotton in Madras Province and Hyderabad State. The disease has been experimentally shown to be of virus origin. Work on the insect vectors of this disease is under investigation.

(46) *Striga Research Scheme.*—This scheme, which is financed jointly by Government and the Imperial Council of Agricultural Research and conducted by the Economic Botanist to Government, is in its sixth year of working. On the completion of the first term of five years the scheme was extended for a further period of five years by the Imperial Council of Agricultural Research. Five varieties of *jowar*, viz., "Bilichigan", "Muddinandyal", "Burma K. K.", "Burma Y. K." and "Bonganhilo", have maintained a high degree of resistance to *striga lutea* in pot tests. "Bonganhilo" is also definitely resistant to *striga densiflora*. Three promising varieties were tested in *striga* infested plots at Gogho in Ahmedabad district, on the Surat Farm and at Mundargi in Dharwar district. Favourable results have been obtained at the first two centres and the work is being continued.

(47) *Research work on Orobanche.*—The work of this scheme aims at the reduction of loss caused by Orobanche attack on the tobacco crop in the Province. It is financed by the Sir Sassoon David Trust Fund. Experimental work on building up strains of tobacco resistant to *Orobanche* attack have not yet given any encouraging results. The possibility of controlling *Orobanche* by the application of chemicals and by organic manuring is under investigation. A 5 per cent. solution of Atlacide, a proprietary weedicide, has been found to be efficacious.

(48) *Miscellaneous Research Work on Plant Diseases* :—

(*a*) *Wilt in Lathyrus sativus.*—The strain Indore T.2-1, which is now homozygous for 100 per cent. wilt resistance, was grown during the year under report on the College Farm with a view to the production of sufficient quantities of seed for conducting village trials in Broach and Panch Mahals district. Some of the local selections of *lang* are also approaching homozygosity for 100 per cent. resistance to wilt. Studies on the mode of inheritance of wilt resistance in *Lathyrus sativus* show that resistance to wilt is a recessive character.

(b) *Koleroga disease on arecanut palm.*—Further evidence has been obtained that, even in outwardly healthy trees, primary infection originates from discoloured areas around the points of attachment of the previous season's bunches to the stem. Notwithstanding the fact that the *koleroga* disease of arecanut palm made its first appearance on May 28th, in the 1943 season, the earliest date of outbreak recorded in North Kanara, and the season was marked by heavy and continuous rains favourable to development and spread of the fungus, there has been progressive improvement in the experimental gardens. There was not only considerable delay in the appearance of the disease but its attack was also mild. In areas of heavy and incessant rainfall in the monsoon season, where the disease continues to be rampant, the use of grassholds soaked in Bordeaux mixture for tying over the bunches has given very promising results in the control of the *koleroga* disease.

(c) *Damping off in tobacco seed beds.*—Experimental work on the control of "damping off" in tobacco seed beds was continued at Nadiad. The results obtained confirm previous years' experiments. Perenox J 29, in the strength of 2½ lbs. in 50 gallons water, and Bordeaux mixture 2–2–50 have been found most effective in controlling the disease. Arrangements are now made by the Plant Pathologist to Government to conduct village trials with these fungicides with a view to demonstrating their efficacy in the control of the disease.

(d) *Fusarium wilts in tur and gram.*—Pot culture tests made at Poona have indicated the availability of some very promising selections from Dohad and Nagpur 352 strains of gram, in respect of wilt resistance.

(e) *Miscellaneous.*—Work was also done on numerous other plant diseases including Verticillium wilt in brinjals, bacterial blight of French beans, leaf spot of betelvines, etc.

(49) *Research Work on Insect Pests.*—Scientific investigations into the prevention and control of damage by insect pests to field and garden crops are being carried out under the Agricultural Entomologist to Government. A severe plague of field rats on crops in certain areas of Gujarat was reported and a demonstration of their control was organised at Dholka in February, 1944. Strychnine sulphate and *Kuchala* seeds proved most effective against these creatures.

Research work on the control of (a) sugarcane borers by *trichogramma* colonization, (b) the betelvine bug, and (c) the grapevine beetle, was continued at Walchandnagar, Bassein and Nasik respectively. The first scheme, which is financed by the Imperial Council of Agricultural Research, was, since its inception, under the control of the Principal Agricultural Officer, Sugarcane Research Scheme, Padegaon. It has now been transferred under the technical and administrative control of the Agricultural Entomologist to Government. Relatively increased yield was obtained from the sugarcane plots treated with *trichogramma* parasites but the significance of this result has yet to be worked out. Three sprayings of tobacco waste in 1 : 15 dilution at intervals of a fortnight proved effective against the betelvine bug. Field scale control measures against the grapevine beetle are in progress and the efficacy of the "Tray method" over the "Tassel" method has been confirmed. The bionomics of the pest have been thoroughly studied. Under laboratory conditions, heavy irrigation reduced the duration of life-cycle of the pest and resulted in the high percentage of mortality in all stages of its life history.

At Poona, experimental work on the control of the wheat weevil indicated that mercury strips, mercury in the powdered form and chlorasol were more effective than other insecticides. These materials will now be given further large scale

trials. Sticky bands and poison baits proved effective against red ants and the use of poisoned baits reduced the percentage of attack of fruit flies. Observations on the incidence of attack and the life-history of certain insect pests of *tur* have also been recorded. A survey of the various insect pests on the College Farm is in progress and valuable information has been collected.

B. Extension and Development Work.

(50) The Plant Pathologist to Government and the Agricultural Entomologist to Government deal with a large number of enquiries from the public covering a wide range of subjects relating to plant diseases and insect pests on crops in all parts of the Province. Work on the plant disease survey of the Province was continued during the year and it is proposed to publish the results of this survey as a supplement to the "Fungi of Bombay", after the War.

CHAPTER V.

SEED SUPPLY.

(51) *Introduction.*—With the expansion and intensification of the "Grow More Food" campaign, activities in connection with the supply of seed especially of improved crop varieties in order to increase the production of food crops, have increased to a very great extent. Seed supply on a very large scale has again been organised in the Deccan and the Karnatak, especially in the Bijapur, Dharwar and Sholapur districts where famine and scarcity conditions prevailed in the previous year. Organised schemes for the multiplication and distribution of seeds of improved varieties of crops, viz., cotton, rice, wheat, *jowar*, *bajri*, etc., were continued as per programmes laid down in the past. Model seed distribution and multiplication schemes for important food crops, viz., rice, wheat, *jowar*, *bajri*, etc., were also continued, assisted by District Rural Development Boards in many areas. This service, i.e., the supply of improved seeds, has become very popular with the public as can be seen from the ever increasing demand for such seeds from the farmers and the demand for the produce of improved varieties of crops both by the trade and by consumers.

(52) *Seed supply in connection with the "Grow More Food" Campaign.*—During the year under report, the supply of seed of improved varieties of food crops was further intensified and expanded. As provided for during the year 1942-43, a total amount of Rs. 12,26,469 was invested in this work during 1943-44, of which Rs. 3,55,372 was irrecoverable. Over one lakh maunds of paddy, *bajri*, *jowar*, wheat and maize were distributed at concession rates, covering an area of about 3·73 lakh acres. On a very rough estimate, the additional increase in outturn of food grains, on this account, is calculated to be about 3 lakh maunds.

(53) *Seed supply in famine and scarcity tracts.*—Due to the prevailing famine and scarcity conditions in the eastern areas of the Deccan and the Karnatak, there occurred a severe scarcity of sowing seeds in those areas, especially in Bijapur and Sholapur districts. Anticipating such a scarcity, the Agricultural Department organised the seed supply of food crops for sowing purposes and distributed about 80,000 bags of food crop seeds mostly of *bajri*, wheat and pulses in the affected tracts. This service was greatly appreciated by farmers and agriculturists and helped, in no small measure, to mitigate the after-effects of the famine. Had it not been for such timely and prompt action, large areas in these

tracts would have remained unsown. The seed thus distributed was partly collected from unaffected areas in the Province and partly from outside the Province, e.g., Hyderabad State.

A. Cotton Seed Distribution.

(54) *Khandesh—Jarila Cotton Seed Multiplication and Distribution Scheme.*—The work under this scheme has now completed its seventh year. In the year under report, 37,700 lbs. of pure seeds were produced on Government farms for further multiplication by registered seed growers in the districts. The seed multiplication area, organised under departmental control, was 1,04,463 acres. A seed stock of 83 lakh lbs. was held by the Department and its approved stockists for distribution next season. Co-operative organisations continued to render valuable co-operation in the work of multiplication and distribution of pure Jarila seed. Sixteen Co-operative Cotton Sale Societies are now working in Khandesh to assist in the marketing and "Agmarking" of pure Jarila cotton. In the year under report, the work of "Agmarking" could not be taken up on account of the unfavourable nature of the season, i.e., heavy mid-October rains, which affected adversely both quality and yield of Jarila cotton. A notable feature of the year was the application of the Cotton Control Act to the district of East Khandesh. The provisions of the amended Ginning and Pressing Factories Act, 1925, have also assisted in checking the mixture of Jarila with other inferior cottons in ginning and pressing factories.

(55) *Gujarat—(a) 1027 A. L. F. Cotton Seed Multiplication and Distribution Scheme.*—During the year under report, 25,000 acres under pure 1027 A. L. F. were controlled by the departmental staff and over 10 lakh lbs. of seeds of this improved variety were stocked and distributed to growers. This amount included 3½ lakhs lbs. sent to the Rajpipla State. The Agricultural Department is now introducing a new improved variety of cotton, "Suyog", in the Surat district which gives a higher profit per acre to the cultivators than 1027 A. L. F. cotton mainly on account of its higher ginning percentage. 15,000 acres under this variety of improved cotton were grown under departmental supervision and over 2½ lakh lbs. of seeds have been distributed to registered growers for further multiplication next season.

(56) *Gujarat—(b) Vijaya Cotton Seed Multiplication and Distribution Scheme.*—The work of the scheme for the multiplication and distribution of B. D. 8 cotton variety has now been completely switched over to the new improved variety, viz. "Vijaya" cotton, from 1st December 1943. During the year under report, the total quantity of pure "Vijaya" cotton, stocked and distributed from various departmental depots, totalled 1,240,776 lbs. which was sown on 110,000 acres. The Department controlled 15,300 acres which included 570 acres grown with Pedigree seed.

(57) *Southern Maratha Country—Jaywant and Gadag No. 1 Cotton Seed Multiplication and Distribution Scheme.*—This scheme was operating in its eighth year in the year under report. Of the organised reserved area of 111,200 acres, 103,300 acres were rogued under departmental supervision in order to ensure purity of Jaywant seed for further multiplication by registered seed growers. The area under Jaywant grown from departmentally controlled seed has been reduced from about 6 lakh acres to 5 lakh acres due to the decrease in the total acreage under the cotton crop as a result of the "Grow More Food" Campaign. A further area of 1¼ lakh acres is estimated to have been grown under Jaywant cotton as a result of natural spread. Seed multiplication and distribution was largely done through "approved agents" and over 54 lakh lbs. of seed

of Jaywant, sufficient for an area of 5½ lakhs of acres, have been stocked for distribution in the ensuing season. The work connected with the multiplication and distribution of Gadag No. 1 seed was organised on similar lines to that of Jaywant. The reserved and rogued area totalled 28,500 acres and, the area grown under the improved variety was 118,600 acres from departmentally controlled seed and 35,000 acres as natural spread. Over 8,700 bags of Gadag No. 1 seed were stocked for distribution in the next year.

B. Rice Seed Distribution.

(58) Over 28½ lakh lbs. of seed of improved varieties of rice were distributed under seed distribution schemes in connection with the "Grow More Food" Campaign. This work was done mainly through the agency of Taluka Development Co-operative Associations and through Government depots. Of this total of 28½ lakh lbs., about 3 lakh lbs. were distributed in the Northern Division, 18½ lakh lbs. in the Southern Division and 7 lakh lbs. in the Konkan Division. In the Northern Division, model seed multiplication and distribution schemes have been organised for the wider extension of improved rice varieties in the Thana, Kolaba and Bombay Suburban districts. The departmental staff supplied 121,800 pounds of seed of improved rice varieties to rice growers working under these schemes. In the Surat district, 3,860 pounds of K. 84 paddy variety were distributed for further multiplication. In the Southern Division, about 6,500 lbs. of seeds of improved varieties of paddy were produced and distributed to farmers in the rice growing areas for the second and third stages of multiplication. In the Konkan Division, seed multiplication and distribution schemes for various improved varieties of rice have now been organised in all the three districts, i.e., Kolaba, Ratnagiri and Kanara. Kumta and Ratnagiri Farms supplied 22,000 pounds of pure pedigree seed of improved high yielding rice varieties to registered seed growers for further multiplication in the district. The staff of the Agricultural Department raised under its supervision 1,77,000 pounds of improved seed which were handed over to various District Rural Development Boards for further multiplication and distribution. The Deputy Director of Agriculture, Crop Research, also issued 33,300 pounds of nucleus seed of various improved strains for further multiplication as a basis of multiplication schemes in the districts.

C. Millets (Jowar and Bajri) Seed Distribution.

(59) Seeds of improved millets, i.e. *jowar* (both *kharif* and *rabi*) and *bajri*, were distributed to growers under the "Grow More Food" Campaign to the extent of over 30½ lakh lbs. Of this amount, 24¼ lakh lbs. were improved *jowar* seed and the remainder, *bajri*. The distribution of *jowar* seed in the Northern, Central and Southern Divisions totalled about 13¾, 8½ and 2 lakh lbs., respectively. As regards seed of *bajri*, the distribution was about 1 lakh lbs. in the Northern Division, 5 lakh lbs. in the Central Division and five thousand lbs. in the Southern Division. Seed of improved varieties of these crops was also under multiplication and distribution in various model seed multiplication and distribution schemes in various districts. In the Northern Division, such a scheme for the extension of improved varieties of *jowar* and *bajri* seed, provided 530 lbs. of *bajri* variety No. 207, obtained from the Deputy Director of Agriculture, Crop Research, which was distributed in Ahmedabad and Kaira districts for further multiplication. In Ahmedabad district, 64,000 lbs. of seeds of the improved variety of *jowar* 10-2 were distributed. In Broach and Panch Mahals district, 56,200 lbs. of *rabi jowar* No. 8 and, in the Surat district, 28,500 lbs. of Budh Perio *jowar* No. 53 were distributed under model seed multiplication and distribution schemes in progress in these districts. Similar schemes for *jowar*

M-35-1 are in progress in Poona, Ahmednagar and Satara districts of the Central Division where 33,600 lbs. of pure seed of this improved variety were handed over to District Rural Development Boards for further multiplication in their areas. In the Southern Division about 5,000 lbs. of pure *jowar* seed, produced under departmental supervision, were distributed for multiplication purposes to progressive cultivators. The Deputy Director of Agriculture, Crop Research, issued 3,400 lbs. of improved seed of *jowar* M-35-1 and M-47-3 from the Mohol Farm for further multiplication in the Central and Southern Divisions.

D. Wheat Seed Distribution.

(60) Under the "Grow More Food" Campaign, about 26 lakh lbs. of seed of improved varieties of wheat were distributed, viz. about 4½ lakh lbs. in the Northern Division, 14½ lakh lbs. in the Central Division and 7 lakh lbs. in the Southern Division. The production of nucleus pure seed of improved wheat varieties at the Cereal Breeding Station, Niphād, amounted to 4,000 lbs. which were distributed in selected districts for further multiplication work under various model seed schemes. Seeds of improved varieties of wheat, i.e., Gulab, Pusa 52, Pusa 4, and Jaya, were distributed in various districts of the Northern Division. In the Central Division, model schemes of multiplication and distribution of the improved wheats "Motya" and "Gulab" are in progress in the East and West Khandesh districts. In the West Khandesh district 56,700 lbs. of pure "Motya" seed were handed over to the District Rural Development Board for further multiplication. Similarly, 58,500 lbs. of pure "Gulab" seed were made available for further multiplication. In the Southern Division the production of nucleus seed of improved wheat No. 808 amounted to 4,000 lbs. This seed was distributed in the districts for further multiplication in accordance with the programme fixed under the model seed multiplication and distribution scheme in these areas.

E. Distribution of Seeds of Other Crops.

(61) Under the "Grow More Food" Campaign, about 2½ lakh lbs. of Sameri maize were distributed. In addition, seed of Chafa gram, which has proved very suitable for the Deccan and Karnatak areas, was multiplied and 3,000 lbs. of this improved seed were distributed from the Cereal Breeding Station, Niphad, for further multiplication. Under the model seed multiplication and distribution scheme which is in progress in the Nasik district 4,480 lbs. of pure seed of Chafa gram were distributed to cultivators during the year under report. In addition, 1,500 lbs. of seed of castor S. 20, 350 lbs. of safflower N. 630, 130 lbs. of N. 84 *tur* and 50 lbs. of sesamum N. 85 were distributed by the Deputy Director of Agriculture, Crop Research, from the various seed farms under his charge.

Under the Potato Storage and Supply (Military) Scheme, Poona, about 32,000 bags of Numbri seed potatoes were purchased at Simla and distributed to potato-growers throughout the Province at a concession rate of two-thirds the cost price, of this total, 20,200 bags were issued to growers in Poona district alone.

CHAPTER VI.

LIVESTOCK WORK.

(62) *Introduction.*—The Livestock Section of the Agricultural Department concerns itself mainly with (*a*) scientific research work into problems of breeding, management and nutrition of cattle, sheep and poultry, and (*b*) extension of the successful results of such work in all districts of the Province. The activities under the former head are mainly concentrated at the Government Cattle Farms at

Bankapur and Tegur, at the Sheep Breeding Research Station, Poona, and its Sub-stations in the districts and at the Government Poultry Farms at Kirkee, Dhulia and Dharwar. The extension work of this section has developed considerably during recent years and has been further supplemented by non-official agencies whose valuable co-operation, especially in cattle improvement, has been obtained in many areas. District Rural Development Boards are also taking a keen interest in livestock development in the areas under their control. Due to this considerable non-official interest and co-operation, work connected with livestock improvement is making rapid progress throughout the Province.

A. Livestock Research Work.

(63) *Cattle.*—At the Government Cattle Farm, Bankapur, work on the improvement of the herd of Amrit Mahal cattle chiefly consists of selective breeding for standardization of type, regularity of calving and early maturity. A small herd of Gir cattle has also been established at this Farm in order to test the suitability of this breed, both for milk production and draught purposes, in the Southern Division of the Province. From the performance of this herd during the last two years, this breed appears to be well suited to this tract. During the year under report, fifteen cows were in milk of which two have given over 4,800 lbs. milk, one over 4,000 lbs. and four over 3,000 lbs. in the normal lactation period.

The work at the Government Cattle Farm, Tegur, is devoted to the evolution of a suitable type of cattle for the heavy rainfall areas of the Province, e.g., the Konkan. The foundation herds of Dangi and Nimari breeds established at this centre have given encouraging results and it is now intended to test these breeds out under below-ghat conditions in the actual Konkan districts. In these areas, where fodder and grazing facilities are limited, the problem of improvement of cattle is closely linked up with the improvement of the quality of the fodder and grazing available and investigations into such problems must be conducted simultaneously with research into cattle improvement by breeding, feeding and management. Although the cows of both breeds have been brought to Tegur recently, 3 Nimar cows have yielded over 1,500 lbs. of milk, while 3 Nimar and 2 Dangi cows have yielded over 1,000 lbs. during the period of lactation.

Among the non-official organizations who are working in co-operation with the Livestock Section of the Agricultural Department for the improvement of cattle, special mention should be made of the improvement of the Gir breed of cattle by the Bombay Gowrakshak Mandali and the Nathu Lalji Charity Trust Fund Gowshala in the Bombay Suburban district and of the Nimari breed of cattle by the Taluka Co-operative Development Association, Jalgaon, at its cattle farm at Pimple, East Khandesh district and by Dr. V. H. Patil at his farm in Patilwadi, West Khandesh. The Institute of Agriculture, Animal Husbandry and Dairying at Anand is now responsible for the continuance of departmental work towards the improvement of the famous Kankrej cattle breed of Gujarat at Anand and Chharodi.

(64) *Sheep—Sheep Breeding Research Scheme, Bombay-Deccan, Poona.*—The work of this scheme, which is subsidized by the Imperial Council of Agricultural Research, has, as its main objective, the improvement of the Deccani breed of sheep by (*a*) selection and (*b*) crossing with the imported Merino breed. The programme of work also includes investigations into problems of sheep feeding and management under Deccan conditions. As a result of this work during the last six years, considerable increase in the percentage of wool in the Farm flocks has been secured. At the main Sheep Breeding Research Station at Poona,

there is now a flock of 53 ewes of selected indigenous Deccani sheep with a predominantly wool coat, and 12 of these carry an all-wool fleece. The cross-bred rams produced at the Station are now being used on shepherds' flocks in Sangola taluka of Sholapur district where a Sub-station at Javle has been established since 1941. A second Sub-station has recently been sanctioned by Government for investigations into the breeding and management of Merino sheep at Belgaum.

The Sheep Breeding Research Station, Poona, and its Sub-stations are also carrying out research work on the more profitable ultilization of wool as a village industry. Improved methods in the preparation, spinning, weaving and dyeing of woollen articles have been evolved. Instruction in these improved methods of wool utilisation is being given to spinners and weavers in selected villages. The introduction of improved sheep, combined with the extension of these improved methods for the more profitable use of the better wool produced, must certainly develop into an important rural industry, especially in some of the most backward tracts of the Province.

(65) *Wool Analysis Laboratory Scheme.*—The Imperial Council of Agricultural Research has established a wool laboratory at Poona which is complementary to the sheep breeding research work. At this laboratory, investigations and examinations are carried out on the important economic characters of wool fibre and the results serve as a most useful guide in the conduct of selective breeding work among the Station flocks. A subsidiary line of research deals with the dyeing of wool and woollen articles with vegetable dyes. Much progress has been made in the preparation of standard shade cards, trials of fastness of different dyes, increased range of colours and shades, etc.

(66) *Poultry—Bombay Poultry Research Scheme, Kirkee.*—The Government Poultry Farms at Kirkee, Dhulia and Dharwar form a series of research stations for scientific investigations into different problems of poultry husbandry. The Central Government Poultry Farm at Kirkee includes a poultry research section financed partly by the Imperial Council of Agricultural Research. A considerable amount of investigation has been done on Indian and imported breeds of fowls epecially in regard to improvement of the egg laying capacity of these breeds and their crosses and on their suitability for Deccan and Southern Maratha conditions. In addition, poultry feeding experiments were continued during the year under report, the results being of special value in view of the present shortage of the more commonly used feeding grains. Much experimental work has been also done on the design and construction of cheap poultry houses for village use. The economics of poultry-keeping is receiving special attention at these centres which are also utilised for the training of cultivators in this industry. Successful and profitable results have been achieved in turkey breeding and rearing at Kirkee, Dharwar and Dhulia.

In addition to training civilian students in poultry management, training classes for selected army personnel in practical poultry management are also being conducted at these three centres. The numbers of such military students trained during the year were 38 at Kirkee, 7 at Dhulia and 13 at Dharwar.

B. Livestock Extension and Development Work.

(67) *Premium Bulls.*—During the year under report, 195 bulls of different breeds were placed out in the districts under the "Premium Bull" Scheme and 112 of the old "premium" bulls were continued at service with selected agents in suitable villages throughout the Province. Of this total number of bulls, 120 were the

progeny of "Premium Bulls" previously issued by the Livestock Section in former years. In July 1944, there were 666 "Premium Bulls" at service in different districts which represents an increase of 58 on last year's total. Under a similar scheme for the distribution of "Premium Cows" for breeding purposes in selected areas, 744 cows have now been issued to approved agents. This "Premium Cow" distribution is a valuable analogical supplement to the "Premium Bull" Scheme and is receiving much financial support from District Rural Development Boards. The demand, both for "Premium Bulls" and "Premium Cows", is increasing considerably in many tracts and, where numbers of these selected stock have been established, most marked improvement in the general standard of village cattle is very noticeable. A great deal of the time of the Livestock Section is being devoted to this type of extension work and, recently, special finance has been made available by Government for its expansion, particularly in backward class tracts of the Province, e.g., in Thana and West Khandesh districts.

(68) *His Excellency the Viceroy's Gift Bull Scheme.*—The scheme of locating "Gift Bulls" initiated by the late Viceroy, Lord Linlithgow, has been now discontinued and the balance of the total collection of Rs. 89,732 made in the Province has been diverted to establish "District Livestock Advance Funds" in many districts. By this means, funds are made available for giving loans at low rates of interest to suitable cultivators for the purchase of selected and approved breeding stock. In this way, the important livestock improvement scheme, inaugurated by the late Viceroy, has been placed on a permanent basis and is a valuable aid and contribution to future livestock improvement in the districts.

(69) *Livestock Improvement Act, 1933.*—During the year under report, nine more villages have taken advantage of this Act which provides for the compulsory castration of inferior male stock in villages on the initiative of local cattle breeders and owners. The total number of villages in the Province to which the Act has now been applied, is 87. Wherever possible, the application of the Act is urged as a preliminary step to the introduction of "Premium" bulls or cows in a village area.

(70) *Co-operation with Gowshalas and Panjrapoles in Cattle Improvement.*—In spite of continued propaganda work by the staff of the Livestock Section, very few local gowshalas and panjrapoles have agreed to co-operate in the work of cattle improvement in the districts. In general, the management of such institutions is not vested in members of the agricultural classes and the need for legislation to control and improve the working of these organizations and to develop their possibilities as centres for livestock improvement remains urgent.

(71) *Cattle Shows, Rallies and Demonstrations.*—Under the auspices of the All-India Cattle Show Society, three major cattle shows were held in the Province during the year. The first of these shows was held at Mahud in Sholapur District in December, 1943, the second at Sanand in Ahmedabad district in January, 1944 and the third at Nasik in February, 1944. At the Mahud show, there was a large and excellent exhibit of Khillar cattle which attracted breeders and buyers from many parts of the Province. The Sanand show dealt mainly with the Kankrej breed of cattle which are so well-known in Gujarat. The Nasik show was organised with the hardy Dangi breed of cattle of Western Ghats, and some very fine specimens of this useful breed were exhibited.

The Livestock Section of the Agricultural Department organised 12 small cattle shows and 15 cattle rallies in different districts, mainly in areas where intensive work on cattle improvement has been carried out in recent years.

(72) *Advisory and Propaganda Work towards Livestock Improvement.*—This forms an important aspect of the work of the Livestock Section in many districts. The Livestock Expert to Government is constantly advising and assisting District Rural Development Boards in the organization of local schemes for livestock improvement. In particular, mention may be made of the organization of the breeders of the Dangi breed of cattle and the initiation of livestock improvement schemes for the benefit of the backward classes. At all Government Livestock Farms, "Farmers' Weeks" were organized and were usually well attended. The staff of the Livestock Section toured considerably in the districts in order to give advice and assistance to cattle breeders and owners.

(73) *Formation of Milk Recording Societies.*—This scheme, which is subsidized by the Imperial Council of Agricultural Research, is at present confined to the Kankrej breed of cattle in Gujarat. The milk yields of 540 cows, distributed through nine villages of Sanand taluka in Ahmedabad district, were recorded at fortnightly intervals and, at each recording, data regarding quality, i.e., fat percentage, were noted. Such work is an essential preliminary to future work in connection with the development of milch breeds by selective breeding. The work of the scheme has now been amalgamated with the activities of the Kankrej Breed Society, established in April, 1943. This Society, in addition to continuing the work of milk recording, is maintaining a registered Herd Book for the Kankrej Breed. To date, 105 members have joined the Society and 536 Kankrej cattle have been accepted for registration in the Herd Book. A similar society was established in Sholapur district in November, 1942, to look after the interests of the Khillar breed of cattle. 590 members have already joined this Society which is formed in one of the most progressive cattle breeding areas of the Province.

(74) *Definition of Breed Characters.*—No further breed was taken up for this work in the year under report.

(75) *District Work on Sheep Improvement.*—Two Sub-stations for sheep improvement work, under the main Sheep Breeding Research Scheme at Poona, have been established at Javale in Sangola taluka of Sholapur district and at Anagawadi in Bagalkot taluka of Bijapur district. At these centres, the full co-operation of local shepherds has been obtained and improved rams introduced into their flocks for the grading up of the local sheep population. In the Sheep Breeding Area of Sangola taluka, there are now 52 selected rams heading flocks of local breeders which include about 1,200 white fleeced breeding ewes. Recently, in the sheep breeding area of Bagalkot taluka, ten flocks of selected woolled sheep have been established which are now headed by farm-bred rams. Attempts to establish white-woolled flocks as a result of selective breeding have been marked with promising success at these two centres. The work of introduction of selected rams to head the flocks of the backward class agriculturists of Bijapur district is now being undertaken and twenty rams have already been placed with shepherds in this area.

(76) *District Work on Poultry Improvement.*—The distribution of improved types of cockerels for breeding purposes in villages and the award of premia to selected and intelligent cultivators who wish to take up poultry keeping as a subsidiary industry in their villages form the main items of district work in connection with improved poultry husbandry. During the year under report, 196 pure White Leghorn cocks and 70 Rhode Island Red cocks were distributed to cultivators at concession rate for improvement of their local poultry. Moreover, 148 dozen hatching eggs of these pure breeds were distributed at

concession rates to cultivators. The wider extension of better poultry in the districts is, however, greatly restricted by the incidence of epidemic diseases for the control of many of which, effective and reliable methods are not yet available. In addition, the marketing of poultry and poultry products in rural areas requires to be put on a more systematic and organized basis if the keepers of improved flocks are to reap the full benefit of their enterprise and labour. Several small poultry farms have been established by certain District Rural Development Boards and these are proving most useful supplements to the work of the Livestock Section in poultry improvement in the districts concerned. At the Government Poultry Farms at Kirkee, Dhulia and Dharwar, courses of instruction in improved poultry husbandry are held periodically, and during the year a large number of students were trained at these centres.

(77) *Apiculture.*—Bee keeping, as a subsidiary village industry, has proved to be of great promise in the below ghat talukas in Kanara district. By the close of the year under report, 1,540 bee colonies had been established and the total output of honey was over 8,500 lbs. worth over Rs. 12,750. Out of the number of bee colonies mentioned above, the owners of 971 colonies were affiliated to the Honawar Bee Keepers' Co-operative Society. The industry has found favour in 77 villages and is carried on by 649 individual bee keepers. Five persons completed a three months' course of training in bee keeping at Honawar.

(78) *Departmental Fodder and Livestock Committee.*—The Committee held two meetings during the year under the chairmanship of the Director of Agriculture. Among the most important subjects discussed at these meetings were schemes for the improvement of milch buffaloes in the Province, the preparation of a leaflet on crops and herbage suitable for silage making, the improvement of fodder residues available for livestock with particular reference to paddy straw, and propaganda measures to encourage rotational grazing on village grazing lands.

(79) *Work of Livestock Section in Famine and Scarcity Areas.*—The organisation and execution of relief measures to alleviate the cattle and fodder position in districts in which famine and scarcity conditions occurred, formed an important part of the work of the Livestock Section. Such work was mainly concentrated in Bijapur and Sholapur districts. The Assistant Livestock Expert was deputed specially for this work and he gave much assistance to the local district officers in the purchase and transport of fodder for use in the affected areas, in the free distribution of fodder seeds, and in the care and maintenance of "Premium" bulls and cows in the famine zone. Several cattle "mass feeding centres", subsidised by Government to the extent of Rs. 1,81,330, were managed under the technical advice of the staff of the Livestock Section. The Bombay Famine Relief Committee organised a scheme of bullock purchase to enable work bullocks to be hired out to needy cultivators. This scheme was also subsidised by Government to the extent of Rs. 32,908. The number of bullocks purchased were 304 but there was only a real demand for such animals ploughing in the Northern part of the district. Another scheme, organised by the Department, provided for hiring out bullocks in areas taken up for extensive land improvement projects to assist cultivators in their field work. The staff under the Assistant Livestock Expert maintained teams of bullocks at various selected centres for this purpose. The staff of the Livestock Section also assisted in the purchase of a large quantity of *kadbi* from the Hyderabad and Sangli States for use in Bijapur district.

(80) *Chicken and Egg Drive Scheme.*—The problem of the adequate supply of eggs and fowls, especially to large towns and military hospitals, became very difficult during the year and was intensified by poultry disease epidemics which occurred

in most poultry exporting districts of the Province. The Province, as a rule, imports much of its table egg and fowl requirements during normal times from other provinces and States but the difficulty of transport facilities under War conditions has considerably curtailed this supply. In order to encourage the local production of eggs and poultry in the Province, a "Chicken and Egg Drive" was commenced to help and encourage poultry breeders and keepers to produce more and better quality eggs by issuing pure-bred cocks and settings of hatching eggs. Assistance was also given in obtaining grain for feeding poultry flocks. This work was concentrated in parts of Sholapur and Satara districts where many people already had graded birds and were anxious to increase their marketable stock. As a result, Pandharpur and Sangola talukas of Sholapur district are now producing a greatly increased quantity of eggs for both table and hatching. Military Poultry Farms are being supplied from this area with both hatching eggs and graded fowls. There are today 170 registered poultry keepers in about 40 villages of these talukas and 118 pure-bred cocks were supplied by Government to them. Further, in order to increase their flocks, 1,679 pure White Leghorn eggs and 1,833 graded eggs were also supplied for hatching. The big hatcheries of the Military Poultry Farms are being supplied with graded eggs from these two talukas.

(81) *Salvage of dry cattle.*—Government has started an experimental dry cattle farm at Palghar to maintain 300 dry buffaloes salved from Bombay City stables. The estimated cost of this Farm is Rs. 1,97,380 and it is designed largely to determine the suitability of this tract for maintaining dry stock. In the past, there have been serious complaints of contagious abortion and other diseases said to be prevalent in the tract. A proposal to start a similar dry cattle farm for 1,000 dry buffaloes at Jamner in East Khandesh is now under consideration of Government.

The Bombay Humanitarian League has undertaken a scheme to establish four mofussil cattle preservation centres to provide for the billeting of 4,000 dry buffaloes with suitable cultivators at the cost of the owners at Kanjri in Kaira district and three other centres in Baroda State, viz., at Nar, Mehsana and Sidhpur. 417 cattle have so far been sent to these four centres. The scheme also provides for the purchase of 500 dry buffaloes to be maintained by Panjrapoles or other agencies and 53 buffaloes have so far been purchased. Government has agreed to subsidise the scheme to the extent of Rs. 32,000 and to aid in setting up the necessary organisation to manage the scheme.

(82) *Reorganisation of the Bombay City Milk Supply.*—The Government of Bombay appointed a Committee on 16th November, 1943, to work out preliminaries of a scheme for the reorganisation of the Bombay City Milk Supply. This Committee consisted of the Director of Agriculture, Chairman and the Director of Veterinary Services, the Director of Dairy Research, Government of India, and the Livestock Expert to the Government of Bombay as members. The Deputy Director of Agriculture, Dairy Farming, was nominated as Secretary of the Committee. The Committee discussed various schemes at its first meeting held on 29th April, 1944, at Poona and has submitted a report and recommendations to Government for consideration.

C. Agricultural College Dairy, Poona.

(83) The Agricultural College Dairy, Kirkee, which is under the control of the Professor of Agriculture, Agricultural College, Poona, is run both as a commercial Dairy and as a centre for practical instruction for students at the Agricultural College, Poona, in animal husbandry and dairying. There are two

rds of milch animals maintained at the Dairy. The herd of Sindhi cows gave an erage outturn of 2,424 lbs. milk per head during the year. The best animal in the rd has now given 5,333 lbs. milk as an annual average over a period of ten lactations. e Surti buffalo herd, which provides the bulk of the milk produced at the Dairy, eraged 3,175 lbs. milk per head. The total quantity of milk produced during the ar under report was 344,923 lbs. of which 15,241 lbs. were fed to calves. The cost production per 100 lbs. milk was Rs. 19-5-6 and receipts Rs. 24-9-6. The Dairy der area produced 4,312,700 lbs. of green fodder at an average cost of Re. 0-7-6 100 lbs.

The Agricultural College Dairy is now inadequate to meet the demands made on it both as a training and teaching centre and as a commercial milk producing tre. The arrangements at present in practice for the segregation of dry and ung cattle and for the production of fodder at a long distance from the main iry, viz., at Manjri, are uneconomic and involve much unnecessary cartage and our. In addition, the existing Dairy buildings are out of date and inadequate. e transfer of the Dairy to a compact and sufficient site in the neighbourhood of ona where better facilities for land and fodder growing can be obtained, must eive consideration in the near future.

CHAPTER VII.

HORTICULTURE.

34) *Introduction.*—The Horticultural Section of the Agricultural Department been actively engaged in the extension of vegetable and fruit cultivation which ns an important part of the "Grow More Food" Campaign in the Province. scheme for scientific research work on seed production of the more common etable crops of the Province has also been initiated at the Agricultural College, ona, in order to investigate the possibilities of producing cheap but reliable, good lity seed of various vegetable crops within the Province instead of having to rely imports from other parts of India and abroad as at present. There is still much pe for extension of fruit cultivation in the Province and the staff of the rticultural Section is devoting its attention to this work. Much interest in easing fruit production is also being taken in many districts by District Rural elopment Boards. Scientific research work on horticultural problems and ning of cultivators and students in advanced horticultural practices form other ortant activities of this Section of the Agricultural Department.

35) *Departmental Fruit and Vegetable Committee.*—Two meetings of the Fruit l Vegetable Committee, of which the Director of Agriculture is the Chairman and Horticulturist to Government the Secretary, were held during the year. The nmittee prepared schemes for research work on vegetable crops and vegetable d production at the Agricultural College, made suitable arrangements for the ervision and co-ordination of horticultural work in the districts and initiated asures for the increased establishment of district nurseries throughout the vince.

A. Horticultural Research.

86) *Government Fruit Experiment Station, Ganeshkhind, Kirkee.*—Scientific earch work on problems of fruit cultivation at this centre was mainly concentrated (a) manurial experiments on *mosambi*, mango and banana, (b) improvement by ection of indigenous fruit crops, (c) investigation into the suitability of different

citrus stocks for budding, etc., and (d) experimental work on grape vine pruning and cultivation. Manurial trials with different combinations of mineral nutrients on *mosambi* trees, which have been conducted for a number of years have been concluded and data obtained are in the course of compilation and examination. Manurial experiments on mango are being continued according to the programme laid down for this work. Selections of the improved type of guava, viz., Lucknow 49, and of pomegranates, viz., G. B. No. 1, have been vegetatively propagated and a parent nursery has been laid down to produce plants of these improved varieties for distribution in the districts. A citrus stock experiment involving the trial of five different root stocks has been laid out with a view to study the degree of resistance to die-back disease shown by variation in the use of different stock plants. The commercial qualities of some notable banana varieties, collected from important banana growing centres are under study. A new technique of pruning has been developed for increasing the bearing capacity of grapevines and an improved method of mango budding has been evolved which secures a higher percentage of success and will be very useful in the more rapid establishment of improved mango orchards. The new varieties of fruit trees that were introduced in the Station last year are progressing satisfactorily. The total receipts of the Ganeshkhind Fruit Experiment Station amounted to Rs. 8,683 against cultivation expenses of Rs. 12,287.

(87) *Investigation into the die-back of Citrus trees.*—Manurial experiments on *mosambi* trees were continued for the fourth year. In one orchard having bearing trees, the application of a complete manure mixture showed a marked improvement, not only in fruiting, but also in height, spread and girth of the trees. The manurial treatments given have resulted in an all-round improvement in the health and vigour of the trees in the other two orchards which have not yet reached bearing stage. This work is supervised by the Agricultural Chemist to Government, B. P., Poona.

B. Horticultural Extension and Development Work.

(88) *Establishment of District Horticultural Nurseries.*—District nurseries established by the Horticultural Section to afford increased facilities to fruit growers in the Province, have made good progress during the year under report. At the Puntamba nursery, 3,000 budded plants of *mosambi* were prepared and issued to cultivators at concession rates. Nearly 13,000 plants have been budded for sale during 1945. Fourteen shade tree nurseries were in existence during the year under report and, from these centres, more than a lakh of shade tree seedlings were supplied free of charge to cultivators on " Arbour Days " arranged by several District Rural Development Boards.

(89) *District Fruit Crop Survey.*—This work was not continued during the year on account of the pressure of more urgent departmental activities.

(90) *District propaganda and advisory work in connection with Horticulture.*—Much of the time of the staff of the Horticultural Section is occupied in answering queries and in giving advice and assistance in horticultural matters to cultivators. There is a notable increase in public interest in the extension of vegetable and fruit crop cultivation as a result of high prices at present ruling in the market for such produce. Certain District Rural Development Boards are playing an important part in promoting fruit cultivation in the areas under their control by encouraging the establishment of district nurseries. The services of the Divisional and District malis who are stationed at such district nurseries are in great demand. The Horticultural Section also took an active part in several District Agricultural Shows where propaganda was carried out for increased fruit and vegetable cultivation.

C. Horticultural Education.

(91) The Horticultural Training Class at the Ganeshkhind Fruit Experiment Station, Kirkee, was attended by 22 students of whom eighteen students, including six boys from the Chembur Home, Bombay, received Government scholarships of the value of Rs. 15 per mensem each. Similar scholarships were also made available to two students nominated by District Rural Development Boards. From these students, the ten most promising were selected to undergo further intensive training as 'Horticultural Apprentices'. During the period of their apprenticeship, the students, who are bound by agreement to serve Government after the completion of their training either as malis or kamgars, receive a stipend of Rs. 20 each per month. These Horticultural Apprentices will, it is hoped, meet the need for trained malis for private service also as there is now great demand for such trained men owing to the rapid horticultural development in the Province.

CHAPTER VIII.

AGRICULTURAL ENGINEERING.

(92) *Introduction.*—The main activities of the Agricultural Engineer to Government are (1) research work on agricultural engineering problems, (2) supervision of departmental plant and buildings and (3) advice and assistance to cultivators in the purchase, maintenance and repairs to power plants, etc., used for agricultural purposes. In addition, the extension of irrigated cultivation by the construction of new wells and the deepening of old wells in order to secure an adequate supply of water for increasing food crop production and as a relief measure against famine in the scarcity areas of the Province formed a very important activity of the Agricultural Engineering Section during the year under report. The Agricultural Engineer was also responsible for scrutinising the demands of cultivators for diesel oil and iron and steel and for arranging supplies and distributing them in the districts. Owing to war conditions much difficulty has been experienced in getting agricultural machinery and further development of the use of power plants for agricultural purposes has been restricted by inadequate supplies of fuel and lubricant oils. However, the work of the Section has been greatly extended and much valuable assistance has been given by its expert staff to cultivators in all parts of the Province especially in connection with increased food crop production.

(93) *Research Work on Agricultural Engineering.*—Research work on the improvement of existing agricultural implements and on devising cheap, new agricultural implements suitable for specific agricultural operations was continued during the year under report although great difficulties were experienced in getting the necessary materials for such work. Exhaustive trials of a modified grass drying machine proved its superiority over the old model as regards capacity and thermal efficiency. This machine has now been shifted to the Nagardale Sheep Breeding Farm for further investigations, particularly in regard to the economics of its operation. Cart wheels fitted with cast iron brushes provided with efficient dust proof and lubricating arrangements were put under heavy duty trials and showed negligible wear on the bearings and axle indicating effective lubrication. Trials with the improved seed drill were continued at the Jalgaon Farm and gave about

2 per cent. higher yi... than the local implement. The trials with the improved clod crusher at the Arbhavi Farm showed that further modifications were needed which will be carried out during the next year.

(94) *Extension work—Advice and assistance to the public.*—The Agricultural Engineer and his staff received and replied to 563 enquiries from agriculturists mainly in connection with boring, pumping and agricultural machinery. Twelve power plants were erected for cultivators and repairs were carried out to thirty-seven. In addition, the routine work of site surveys, preparation of estimates and inspection of power plants was carried out as usual by the district staff of the Agricultural Engineering Section. The Agricultural Engineer was also occupied with a number of departmental constructional works, viz., potato storage sheds, rat proof store rooms, cotton storage sheds, etc. Boring and pumping plants were let out on hire and a total sum of Rs. 4,525 was realised from this source as hire charges.

(95) *Special schemes worked by the Agricultural Engineering Section*—

(1) *Diesel Oil Distribution Scheme.*—As agriculturists who possess power plants, e.g., oil engines, etc., were experiencing great difficulty in getting adequate supplies of diesel oil in time for their agricultural operations, the Agricultural Engineer was entrusted with the work of collecting data, upon which an effective system of allotment and supply of fuel and lubricant oils for agricultural purposes and its distribution to individual consumers, could be based. This work, for which a special staff has been engaged, is still in progress. Permits to individual power plant owners for a monthly quota will be fixed and issued for the ensuing *rabi* season.

(2) *Well Boring.*—A small well boring section has again been started under the Agricultural Engineer to Government. This Section is equipped with hand boring machines capable of taking 3″ bores up to 100 ft. depth. Work has at present been confined to the four districts of Kaira, Thana, Sholapur and Dharwar only, as conditions for successful boring are found to be more favourable in these areas. The boring operations will be carried out at the concessional rates of Re. 1 per foot for the first 50 feet depth and Rs. 1-4-0 per foot for boring beyond this limit. The necessary labour and half the cost of transport are provided by the well owners taking advantage of the work of the Section.

(3) *Well Construction and Improvement Scheme.*—A scheme for (*a*) the construction of 500 new wells, (*b*) the improvement of 500 old wells by cleaning, deepening and repairing masonry work and (*c*) improving another 1,000 wells by taking unlined bores in them to increase water supply, was sanctioned by Government for adoption in the dry and scarcity areas of the Province. Under this scheme, Government will give a subsidy of 33 per cent. of the total actual cost of constructing a new well (with a maximum limit of Rs. 300) and 50 per cent. of the total actual cost of improving an old well (with a maximum limit of Rs. 125). The cultivators who benefit under this scheme have, in return, to agree to grow food crops only on the area irrigated by the wells, new or improved, for the duration of the War and two years thereafter. In accordance with this scheme, 23 new wells are already under construction and 76 old ones are being repaired. The work of scrutinising fresh applications is in progress and it is expected that the work will develop rapidly in the areas of operation. The part of the scheme relating to taking unlined bores in North Gujarat was not found to be popular and had to be dropped.

(4) *Iron Supply Scheme.*—In order to enable cultivators to ' ' in adequate supplies of iron and steel for the manufacture and repair of agricultural implements and tools, Government has undertaken to purchase large supplies of these materials and has entrusted the work of distribution to the Agricultural Engineer. The raw material is supplied on credit to Taluka Development Associations, Co-operative Societies, etc., according to indents submitted by such institutions from time to time and is then sold to agriculturists at controlled rates. The sale proceeds are afterwards remitted to Government. Twenty-three Associations have been supplied with 165 tons of iron in the last two months of the year under report and further supplies are being made as additional material is received and distributed.

CHAPTER IX.

LAND DEVELOPMENT WORK.

(96) *Introduction.*—The activities of the Land Development Section of the Agricultural Department were very greatly intensified during the year under report mainly as a result of the prevalence of famine and scarcity conditions over wide areas, particularly in the Central and Southern Divisions. As reported last year, a beginning was made in April, 1943, with a very large scheme for mass land improvement, i.e., contour bunding and trenching, gully plugging, afforestation, etc., in Bijapur and Sholapur districts (*a*) as a measure of famine relief and (*b*) as an extensive experiment in soil conservation, anti-erosion and dry farming measures. This concentrated experimental work was carried on up to the end of March, 1944, and, in addition to protecting large areas of land from erosion damage, it provided useful and constructive work for considerable numbers of famine labourers whom it enabled to maintain themselves and their families throughout a very severe famine period. In Bijapur district alone, an area of 1,25,000 acres was put under land improvement, i.e. contour bunded and trenched, etc., by the end of March, 1944. The total cost of this work was about Rs. 10,39,000. The number of daily labourers employed reached the peak of 40,000 in August, 1943. These works, which were carried out entirely at Government cost, were of great experimental value and supplied most useful and fundamental information on numerous technical aspects of land improvement for soil conservation and anti-erosion measures, e.g., the optimum height, width and spacing of contour bunds on different types of soil and on different gradients of land, cost of bund construction, organisation of labour for land improvement work, etc. In addition, the works had considerable educative and propaganda value and have resulted in large numbers of cultivators in numerous villages coming forward to co-operate with their fellow-agriculturists and with Government in the extension of similar measures on their own lands as a permanent protection against erosion damage and as a means of obtaining better crop even in years of insufficient and ill-distributed rainfall.

As stated above, the Agricultural Department concentrated its attention on land improvement work in the so called "dry" area of the Province, i.e., mainly in Sholapur and Bijapur districts. However, during the year under report, a beginning was made with similar experimental work in the heavy rainfall tract of the Konkan, i.e., in Ratnagiri district. In such areas, the technique of land improvement must necessarily differ considerably from that found suitable in tracts of scarcity and insufficient rainfall and the experiments laid down are designed to check the rush of rain water off steep hillsides, to control the movement of rain water in gullies and to establish conditions of soil moisture in the lower lands which would enable more profitable forms of agriculture to be undertaken in these areas.

It is gratifying to report that His Excellency the Viceroy and His Excellency the Governor of Bombay inspected the land improvement works in Bijapur district uring the last famine. A large number of officers from other Provinces and Indian States paid visits to the works and were greatly impressed by the useful results which are already becoming evident in increased crop yields and in better agricultural conditions over the areas which have been operated upon by the staff of the Land Development Section.

(97) *Large Scale Bunding Projects.*—These land improvement projects are designed to ensure the conservation of soil and rain-water as a means to increased crop production and to check the considerable damage caused annually by erosion on unprotected hill slopes and the cultivated fields at their base. This object has been achieved by contour bunding, i.e., the construction of a series of medium sized field bunds across the slope of the land and along its natural contours within the whole of a catchment area. In addition to such contour bunding of cultivable lands, the uncultivated upper slopes of the "project area" are contour trenched and re-afforested thus giving protection from unregulated run-off to the agricultural lands in the lower areas of the watershed. In addition, steps are taken to introduce the scientific "dry farming" method of cultivation, known as the "Bombay Dry Farming System", in the contour bunded areas. As stated above, an area of about 1,25,000 acres in Bijapur district and 8,000 acres in Sholapur district has been contour bunded or trenched at Government cost. This work, as previously mentioned, was not only a constructive measure of famine relief but comprised an extensive experiment on the technical aspects and the economics of land improvement work in the Deccan. As a result of these large scale experimental contour bunding works and of the introduction thereon of scientific dry farming methods over many thousands of acres, much immediate benefit resulted to the land owners concerned in increased crop yields. In some areas yields of from 3 to 6 times that obtained in adjoining unimproved fields were obtained in areas where scientific contour bunding followed up by improved farming methods had been practised. The results of the experimental work so far carried out indicate that contour bunds with a base of 8 ft. and a height of 3 ft. spaced at approximately every 3 ft. drop in contour level over the entire area of a watershed is the most effective and economical method of dealing with the soil conservation and anti-erosion problems in the areas in which the Land Development Section has been operating. In such areas, the annual rainfall varies from 15" to 24". Such a system of strict contour bunding does not require the provision of waste-weirs in the bunds as the "compartmentation" of the area by the contour bunds has proved adequate to contain the precipitations of rainfall and enable them to be absorved gradually into the sub-soil layers. During the period from 15th September to 15 October, 1943, there was an almost unprecedented rainfall, totalling over 15", in Bijapur district. Precipitations were received which exceeded 6" in 24 hours but, practically without exception, the system of contour bunds constructed by the Land Development Section, held up all surface run-off and remained unbreached under this exceptional test. The cost of contour bunding work is now being worked out by the accounts staff attached to the Land Development Section. From such data as are already available, it is estimated that it should approximate to Rs. 12 per acre on an average. As a result of the success achieved under the experimental work mentioned above, Government has now reorganised fully the Land Development Section of the Agricultural Department and has expanded the staff to enable it to extend its useful activities to other areas in the Province. In 1944–45, it has been decided to aim at the execution of land improvement works over a total area of 5 lakh acres, viz., 2 lakh acres in the Deccan districts of Ahmednagar, Sholapur, Satara and

Poona and 3 lakh acres in the Karnatak districts of Bijapur, Dharwar and Belgaum. Government has also decided that this work of land improvement, to be executed during the year 1944-45, should be carried out at Government cost in the first instance but that a portion of such cost, viz., Rs. 9 per acre, should be recovered from the holders of the lands in 12 annual equated instalments of annas 12, free of interest. The recovery of the cultivators' share of the cost of land improvement work will not be commenced until after the expiry of two years from the date on which the land has been improved. Many cultivators have now realised fully the importance of the soil erosion problem and the benefits of the large scale land improvement projects which have been carried out as a solution to this problem. It is, therefore, anticipated that, if the labour situation is favourable, the proposed programme of contour bunding 5 lakh acres will be fully achieved by the end of 1944-45. Since April, 1944, up to the end of the period of this report, an area of 25,200 acres in the Deccan districts and 8,700 acres in the Karnatak districts, extending over 38 centres and 58 villages, respectively, have already been contour bunded.

In addition to contour bunding of cultivable land, the grazing lands and waste areas included in the catchment areas were contour trenched and suitable seedling trees were planted along the trench berms. In Bijapur district, an area of about 33,000 acres was thus contour trenched, of which 3,000 acres have already been afforested. This tree growth was fully established by the end of the year under report. Intensive work is also being done to introduce widely scientific dry farming methods of cultivation over the contour bunded areas and, with this object in view, the necessary improved tillage implements have already been purchased and stocked for giving on loan to cultivators. All the expenditure on this item is entirely borne by Government.

(98) *Village Developmental Projects.*—During the year under report, two new Village Developmental Projects were sanctioned, thus making a total of forty such projects, thirty-six of which are subsidised by grants from the Sir Cusrow Wadia Trust Fund and the remaining four being sanctioned by Government as a measure of famine relief. The total area under these projects is about 42,000 acres, i.e., 30,000 acres spread over 24 projects in the North Circle and 12,000 acres spread over 16 projects in the South Circle. Up-to-date, earth work under all the projects in the South Circle, i.e., over an area of 12,000 acres, and over an area of 11,700 acres in the North Circle was completed. As indicated in last year's report, the results of the experimental large scale bunding works carried out in Sholapur and Bijapur districts have indicated that considerable modifications in the technical aspects of the work being executed under these projects are necessary. Accordingly, the plans for these works have been remodelled and, as a result, it has been possible to cut down the cost considerably. All such projects are now being carried out on lines similar to large scale bunding projects though on a much smaller scale.

(99) *Block Bunding Schemes.*—As reported last year, there is little utility or permanence in such individual, small and unrelated bunding schemes. Accordingly, it has been decided that after finishing up works on hand covering an area of about 3,000 acres in Bijapur district, schemes of this type should be discontinued.

At the instance of the Collector of Sholapur, the Land Development Section prepared plans and estimates for six land improvement schemes on service Inam lands with a view to provide works for local famine labour in the Sholapur district. Out of the total area of about 2,000 acres involved in these schemes, an area of about 600 acres was improved by the Land Development Section. The staff of that Section also gave technical advice and supervision in respect of remaining area.

(100) *Experimental Land Developmental Projects in Ratnagiri district.*—Investigation, on an experimental scale, into the problems of soil and water conservation in areas of high rainfall was undertaken, for the first time by the Land Development Section in Khed taluka of Ratnagiri district. The major lines of experimentation consisted of (1) contour trenching of upper hill slopes in order to check the downward flow of rain water and thus to enable it to percolate more readily and slowly through the soil and sub-soil—it was anticipated that the result of such work would be to improve the water holding capacity of the hill-sides and thus to enable rice crops to be grown over larger areas in replacement of inferior millets which are the main crops on these lands at present ; (2) contour trenching of lands suitable for fruit tree cultivation, e.g., mangoes, cashew nut, etc.; (3) gully plugging of hill-side ravines and nullahs to accelerate silt deposition and thus increase the areas of lower fields suitable for rice cultivation, etc.; and (4) experimental treatment of hard laterite rock areas to accelerate the gradual disintegration of the rocky surface under flooding, followed by suitable cropping, manuring, etc. This work was started in the middle of May, 1944, at selected sites at Sukivili, Awashi-Asgani, Sawarda, Hatkhamba and Marjoli villages in Ratnagiri district. Much difficulty was experienced in obtaining labour at reasonable rates and, by the end of June, 1944, an area of only about 300 acres was completed.

(101) *Training in anti-erosion and Dry Farming methods.*—As reported last year, courses for the practical instruction of land surveyors and bunding overseers were conducted at Sholapur and Bijapur. One hundred students were trained, of which 92 students were absorbed in the Land Development Section as Bunding Overseers. At the end of the first course, it was decided to close down the Sholapur Centre and to centralise this work at Bijapur. Accordingly, this Centre was expanded so as to enable 100 students to be trained at one time. Requests were also received from many State authorities for training their candidates in land improvement technique. Government has agreed to reserve ten seats at the Bijapur Centre for students from Indian States and other Provinces. At the expanded Bijapur Training Centre, eighty-four students from this Province were under training. In order to obtain the fullest advantage of the soil and water conservation resulting from contour bunding under large scale bunding projects, it is necessary that such work should be supplemented by the wholesale introduction of improved methods of scientific dry farming, i.e., the " Bombay Dry Farming System ". The need for a centre to train special " dry farming " staff for work among the cultivators is urgent and steps are being taken to establish a Dry Farming Training Centre at Sholapur. The staff trained at such a Centre, when established, will be used to demonstrate, accelerate and expand the introduction of scientific dry farming methods in the contour bunded areas and thus to enable cultivators to get the fullest possible benefit from the land improvement work carried out on their lands.

(102) *Repairs and Maintenance of improvement works.*—The Bombay Land Improvement Schemes Act, 1942, provides essential legal machinery to ensure regular repair and maintenance of all land improvement works, e.g., contour bunds, trenches, etc., by the land-owners upon whose lands they have been constructed and who will benefit from them. The work of bringing all land improvements schemes under the purview of the Act and of preparing the necessary alterations and additions in " records of rights " and village maps is in progress. In addition, the Cattle Trespass Act, 1871, has been applied to the reafforested areas within the land improvement projects in seventy-six villages in the Bijapur district in order to reduce the risk of damage to the young trees by wandering herds of goats and other livestock.

CHAPTER X.

AGRICULTURAL PROPAGANDA.

(103) *Introduction.*—Propaganda and extension work in connection with the "Grow More Food" Campaign, especially in connection with schemes designed to increase food production per acre by the distribution of improved varieties of crops, manures, etc., at concession rates again took a leading place in the activities of the district staff of the Agricultural Department. In addition, the district staff continued their normal activities to popularise improved methods of agriculture and to supply better materials required by the cultivators, e.g., seed, manure, implements, insecticides, etc., on a large scale than in previous year.

(104) "*Grow More Food*" *Campaign.*—This campaign was continued vigorously on lines similar to work done in the previous year. The campaign was mainly directed towards increasing the area under food crop cultivation by reducing the area under non-food crops such as cotton and tobacco and to increasing the yield per acre of the main food crops particularly cereal food crops e.g., rice, wheat, millets, etc. As in the previous year, every possible method of bringing home to the cultivators the necessity of more food crop production was brought into use. Striking pictorial posters advocating increased cereal and vegetable food production and dealing with approved methods of land improvement and soil and water conservation were prepared and displayed in suitable centres to attract the attention of the cultivators. Leaflets in regional languages explaining the objects of the campaign were widely distributed and read to agriculturists at organised gatherings. About 13,620 village and taluka meetings were held, at which the importance of growing more food crops and the concessions granted to cultivators to enable them to do so, were explained. These meetings were organised mainly with the cooperation of non-officials who rendered valuable assistance in this work. Food "Crop Production Weeks" and "Fortnights" were arranged in many areas before the *kharif* and *rabi* seasons during which daily meetings were held and intensive propaganda was conducted. Twenty ballad singers were appointed to supplement the propaganda for increased food production in a popular and easily appreciated manner. They attracted large crowds of cultivators to which they sang special ballads prepared on different aspects of the "Grow More Food" Campaign, suited to different tracts.

Seeds of improved varieties of important food crops, e.g., rice, *jowar*, *bajri*, wheat etc., were distributed on a large scale at concession rates all over the Province. Details are given in paragraph (52). Over 6,000 tons of groundnut cake were supplied to cultivators at subsidised prices in order to encourage the manuring of paddy, irrigated wheat and *jowar* and thus to increase yields per acre of these crops. The total cost to Government on this account was about Rs. 3,25,000. Canal water was given at concession rates to irrigators for food crop production and the irrigation rates for *kharif* food crops were reduced from Rs. 3 to Re. 1 per acre and for *rabi* crops from Rs. 5 to Rs. 3 per acre.

The results of the "Campaign" were encouraging. The total acreage and outturn of the main food crops, i.e., cereals and pulses taken together, increased in 1943 in comparison to the preceding year by 3 lakh acres and 4 lakh tons respectively.

In the *kharif* season of 1943, the adverse seasonal conditions militated against the success of the campaign. The area and outturn of *kharif jowar* were 24·18 lakh acres and 5·71 lakh tons, respectively, as compared with 26·33 lakh acres and 5·18 lakh tons in 1942. The area and outturn of *bajri* were 50·77 lakh

acres and 6·38 lakh tons in 1943 as compared with 52·83 lakh acres and 6·25 lakh tons in 1942. The area and outturn under *tur* in 1943 were 4·88 lakh acres and 1·31 lakh tons respectively, as compared with 4·67 lakh acres and 1·02 lakh tons in 1942.

In the *rabi* season of 1943–44, however, the effect of the campaign was more prominently seen. The acreage and outturn under wheat in 1943 were 15·62 lakh acres and 2·70 lakh tons respectively, against 13·29 lakh acres and 2·38 lakh tons in 1942. The acreage and outturn of *rabi jowar* in 1943 were 51·67 lakh acres and 7·67 lakh tons respectively, against 47·44 lakh acres and 5·31 lakh tons in 1942. The acreage and outturn under gram in 1943 were 4·84 lakh acres and 79,000 tons, respectively, against 4·24 lakh acres and 67,000 tons in 1942. The acreage under main *rabi* crops increased from 64·99 lakh acres in 1942 to 73·14 lakh acres in 1943 and the corresponding figures of increase in outturn are from 8·36 lakh tons to 11·16 lakh tons.

It is interesting to note that the area under tobacco decreased from 1,27,000 acres in 1942 to 1,04,000 acres in 1943, the corresponding decrease in the outturn being from 27,000 tons in 1942 to 22,000 tons in 1943.

The area under cotton, which was reduced from 40 lakh acres to 28½ lakh acres in 1942–43 slightly increased to 30 lakh acres during the year 1943–44. Government has now decided to control the acreage under cotton and other non-food crops by legislation in order to ensure more food crop production in the Province. With this end in view, the Bombay "Growth of Food Crops" Act was first published at the end of the year under report, i.e., 20th May, 1944. This Act limits the cultivation of non-food crops, especially of short and medium stapled cotton, in many areas of the Province and, in addition, prescribes the proportion of individual holdings which must be cultivated under important and essential food crop, especially cereal food crops.

(105) *Taluka Demonstration Centres.*—Forty new Taluka Demonstration Centres were opened during the year under report, thus bringing the total number of such Centres in the Province to 174, i.e., 47 in the Northern Division, 65 in the Central Division, 38 in the Southern Division and 24 in the Konkan Division. These Centres have proved very useful in demonstrating widely and on cultivators' own lands improved methods of agriculture suitable to the tract in which the Centres are situated. Seed and implement depots, which are part and parcel of each Centre have become very popular among the cultivators of the surrounding villages. Effective propaganda in connection with the "Grow More Food" Campaign and The Bombay Growth of Food Crops Act, 1944, was carried out in a very intensive way through the departmental kamgars, one of whom is stationed at each of these Centres and carries on propaganda, etc., in nearby villages.

(106) *Model Agricultural Projects.*—The work of these Projects was carried out in the year under report according to the approved technical programmes laid down. The Project at Rayam (Surat District) now comprises the holdings of 30 farmers covering an area of 468 acres. The main items of improvements carried out during the year were land improvement, including laying out of drains and contour bunds, wider sowing of cotton, *dhaincha* green manuring between cotton rows, top dressing with groundnut cake to the cotton crop, timely interculturing and the use of seeds of improved varieties of both cotton and *jowar*. As a result, the farmers working under the scheme have realised higher profits. The second project at Mirakhedi (Broach and Panch Mahals district) in the Bhil area included 24 holders, against 14 of the last year, with a total area of 317 acres.

(107) *Scheme for the Composting of Municipal Refuse into Manure.*—With the object of increasing the available supplies of organic manure to assist increased food crop production, a scheme for the extensive composting of municipal refuse was sponsored by the Imperial Council of Agricultural Research. This scheme was inaugurated in the year under report. After receiving training under the Chief Bio-chemist, the Provincial Bio-chemist started the training of Sanitary Inspectors in scientific compost manufacture. Fourteen Municipalities have so far taken advantage of this course of training and have deputed their Sanitary Inspectors to the initial course of training after which they will institute compost manufacture, according to the improved and scientific methods, in the municipal areas.

(108) *"Officials" Demonstrations and "Farmers' Weeks" on Government Farms.*—The educational and propaganda gatherings of (a) local officials and (b) cultivators in the districts at Government Farms, and Research Stations on previously fixed "Days" and "Weeks" were arranged on all such institutions during the year under report. This method of propaganda has become very useful in extending the knowledge of the work done by the Agricultural Department in agricultural improvements not only among the agriculturists but also among local officials of other Government departments who are in constant contact with the cultivators and who can educate and advice them as a result of such training.

CHAPTER XI.

AGRICULTURAL EDUCATION.

(109) *The College of Agriculture, Poona.*—The institution has now completed its thirty-sixth year of working and continues to be the centre of agricultural education and of scientific research in specialised branches of agriculture in the Province. The number of students attending the College was 224 of whom 114, 58 and 52 were in the F.Sc. (Agri.), S.Sc. (Agri.) and B.Sc. (Agri.) classes, respectively. 68 students appeared for the B.Sc. (Agri.) University examination held in March, 1944, of whom 63 were successful. This high percentage of success is largely due to the increased practical training and intensive field work which all students have now got to undergo.

Five post-graduate students attended the College during the year under report. Five different scientific sections at the College are at present recognised for admission of students for post-graduate study.

There were eleven students in the Forest Rangers' Course, of whom seven were selected by the Government of Bombay and three were deputed by Indian States. This Forest Rangers' Course was discontinued from May, 1944.

The Chinese Agricultural Commission paid a visit to the College on 2nd December, 1943 and expressed great interest and appreciation of the work being done there.

During the year under report, a beginning was made in the direction of the expansion of the College to meet possible post-War requirements of trained agricultural officers. The establishment of a large training centre at Manjri for Agricultural Assistants and Kamgars under the Post-War Reconstruction Schemes also took place in the year under report. The Training Centre at Manjri is under the administrative charge of the Principal, Agricultural College, Poona.

(110) *District Agricultural Schools.*—There has been no addition to the number of District Agricultural Schools in the Province but the two existing institutions of this type, viz., the Marathi Agricultural School at Dhulia, West Khandesh district,

and the Kannada Agricultural School at Devihosur, Dharwar district, worked successfully during the year under report.

The Marathi Agricultural School, Dhulia, completed its twentieth year of working. 110 applications for admission were received and 29 students were admitted on the recommendation of the Local Agricultural School Committee. Of these, 9 students were allowed to attend the school as day students. The total strength of the students during the year was 49, of whom 29 were in the first year and 20 in the second year. Up to date, 292 students have passed out from this school. A course of training in agriculture lasting for 8 months for primary school teachers from the Deccan districts was also held at this School and was attended by 10 teachers. The Local Agricultural School Committee continues to take much interest in the working of the school and its success is largely due to their cooperation and enthusiasm. The Committee hopes to arrange hostel arrangements for 20 more students so that, next year the full strength of 60 students can be accommodated in the school premises.

The Kannada Agricultural School, Devihosur, completed its thirtieth year. It was attended by 33 students, 18 in the first year and 15 in the second year. Up to date, 355 students have received training in improved agriculture at this centre.

The non-officially organised and controlled agricultural schools at Puntamba in Ahmednagar district and at Rajapur in the Ratnagiri district had a successful year's working and are proving most useful centres for agricultural education on practical lines in the areas in which they are situated.

(111) *Rural Assistants' Training Centres.*—During the year under report, the work of training rural assistants was continued at six centres in the Province, viz., at Broach and Bordi in the Northern Division, at Manjri and Dhulia in the Central Division, at Devihosur in the Southern Division and at Rajapur in the Konkan Division. The total number of rural assistants trained at these centres was 158 and the great majority of these have now been employed in rural development work under different Government departments. During the last three months of their training, the rural assistants are given specialised instruction and practical experience in different aspects of rural development work for which they have shown special aptitude.

The centres at Broach and Bordi were closed from May 1944.

CHAPTER XII.

MISCELLANEOUS WORK.

MILITARY AND CIVIL SUPPLY SCHEMES.

(112) *Potato Storage and Supply (Military) Scheme.*—The first year's working of this scheme, covering all phases including the purchase of 17,936 bags of seed potatoes at Simla and the storage and supply of 80,753 bags to the military authorities, has been successfully and profitably completed. The loss of approximately Rs. 4,25,000 incurred in the supply of seed potatoes to growers at a concessional rate has been fully recovered and a considerable profit made after meeting all the expenditure on the scheme, both capital and recurring. The favourable financial position of this complicated scheme is largely due to low storage loss which amounted only to about 6 per cent. The scheme has now been extended and enlarged to provide for a supply to the military authorities of at least 30,000 bags of potatoes (56,000 maunds) monthly for about 10½ months in the year. In addition, the Scheme provides to a considerable extent the requirements of the civil markets in the four Deccan districts

of Poona, Nasik, Satara and Ahmednagar, in which the scheme is being operated. In the first phase of the extended scheme, about 32,000 bags of seed potatoes were purchased at Simla and have been distributed to growers in the Province. The growers, to whom these seed potatoes were supplied, entered into agreements with Government whereby they undertook to sell their entire produce to the Agricultural Department at fixed rates in three or four monthly instalments. Under this arrangement, over 1,82,000 bags of potatoes were purchased from the bonded cultivators during the period February 15th—July 31, 1944. Of this quantity, 1,31,000 bags were supplied to the military authorities during the above period. A special feature of the extended scheme is that it makes full provision for civil supply in the districts in which it is being operated in addition to providing for heavy military requirements.

(113) *Vegetable Extension and Supply (Military) Scheme.*—During the year 1943-44, the vegetable and onion requirements of the military authorities were increased and intimation was given early in July, 1943, that provision should be made for larger production of these crops in the districts of Poona, Nasik and Ahmednagar. Accordingly, a scheme for the expansion of the areas under controlled vegetable cultivation under the scheme to the extent of 9,000 additional acres per annum, instead of 4,000 additional acres as in the previous year, was put into operation. In order to extend the work to Belgaum district and the Mahableshwar peta of Satara district, both of which tracts are well suited for vegetable growing, three more centres were opened, thus increasing the number of production zones or centres from seven to ten. Seeds of cabbage, cauliflower, knolkhol, turnip, beet, carrots, and radish sufficient to supply the requirements of sowing seed in the extended areas were obtained from the U. S. A. and other sources and supplied to the registered vegetable growers. Arrangements were made to procure cake manures and sulphate of ammonia for supply to the growers for the manuring of their vegetable areas. Irrigation to the lands of growers registered under the scheme was given priority in canal irrigated areas and, in places where wells had to be depended upon for irrigation, electric connections for pumps were obtained. Oil engines were supplied, cement was made available for erecting foundations for oil engines and full requirements of fuel and lubricating oils were supplied. Additional staff was sanctioned with effect from 1st April, 1944, to meet the requirements of the expanded scheme.

During the year, a similar scheme was also undertaken for the supply of fresh vegetables from Surat to Bombay City for the benefit of the civil population. This scheme started on the 18th September, 1943. An area of three hundred acres was registered in the vicinity of Surat and vegetables were dispatched daily from the registered vegetable growers in the Surat area to the Controller of Government Grain Shops, Bombay. This officer arranged for their sale at reasonable prices through Government Grain Shops. The effect of this work has been to reduce the general level of prices of vegetables in the Bombay market in the interests of consumers, especially those of the poorer classes. It is intended to extend the scheme to all Government Grain Shops in Bombay City and to supply more varieties and larger quantities of vegetables from Surat and other suitable centres to the City consumers.

The Government of Bengal sent its Assistant Director of Agriculture to study the vegetable schemes operating in the Bombay Province.

The annual average supplies of vegetables and onions to the military from the ten zones now operating under the scheme amounted to 77,000 lbs. per day. In addition, 6,000 lbs. per day were sent from the Surat zone to the civil market in Bombay.

CHAPTER XIII.

ADMINISTRATION AND FINANCE.

A. ADMINISTRATION.

(114) *Introduction.*—During the year under report, the most important activities of the Agricultural Department, e.g., the "Grow More Food" Campaign, Land Improvement Schemes, the Civil and Military Vegetable and Potato Supply Scheme, etc., were continued and enlarged. In addition to the Vegetable and Potato Supply Schemes, a small scheme for the supply of eggs and chicken to the military was also introduced. Other important matters dealt with during the year under report are (1) Reorganisation of Bombay City Milk Supply, (2) Scheme for Supply of Iron and Steel to Cultivators for Agricultural Implements, (3) Scheme for Supply of Groundnut Cake to Cultivators, and (4) Scheme for Composting Town Refuse into Manure. The latter two schemes form part of the "Grow More Food" Campaign work in the Province.

Owing to the closure of the Bombay Dry Farming Research Scheme subsidized by the Imperial Council of Agricultural Research the two Research Stations at Sholapur and Bijapur were taken over by Government and are being utilised for carrying on scientific work on agricultural research and crop improvement in the "Scarcity" areas of the Province.

Scientific research work, which is the basis of all agricultural improvement in the Province, has been continued and all the research staff have carried out their duties satisfactorily, in spite of unavoidable difficulties and handicaps resulting from the War. The generous financial assistance of such bodies as the Imperial Council of Agricultural Research, the Indian Central Cotton Committee and the Sir Sassoon David Trust Fund and contributions from the Sugar Excise Fund in subsidising important research activities have been continued.

(115) *Staff.*—Mr. W. J. Jenkins held charge of the post of the Director of Agriculture throughout the year under report.

The undernoted major changes in staff took place during the year under report :—

Rao Saheb S. H. Prayag, O.B.E., was appointed as Deputy Director of Agriculture, Southern Division, vice Rao Bahadur S. S. Salimath who has been appointed as Deputy Director of Agriculture, Headquarters, in charge of "Grow More Food" Campaign.

Mr. G. P. Patil officiated as Deputy Director of Agriculture, Central Division, Poona, vice Rao Saheb S. H. Prayag, O.B.E., transferred.

Messrs. D. B. Kolhe and G. S. Godbole were confirmed in the posts of Livestock Expert to Government and Assistant Professor of Dairying and Animal Husbandry and Manager, Agricultural College Dairy, Kirkee, respectively.

Mr. S. R. Gandhi was appointed as Assistant Horticulturist to Government in place of Mr. P. G. Dani, deceased.

The post of Soil Physicist to Government, held in abeyance, was revived, and Dr. V. N. Gokhale was appointed to hold it till his retirement, i.e., 31st March, 1944. Dr. J. K. Basu took charge of the post of the Soil Physicist from 17th April, 1944.

The post of the Deputy Director of Agriculture, Konkan Division, was revived for a period of two years and Rao Bahadur Dr. R. D. Rege appointed to hold it as Deputy Director of Agriculture (Additional) in the Office of the Director of Agriculture.

The post of the Personal Assistant to the Director of Agriculture was revived for a period of one year and Mr. A. P. Mulay appointed to hold it.

For the satisfactory execution of important schemes such as Land Improvement works, Organisation of Bombay City Milk Supply, the Military Supply Schemes, etc., services of senior experienced retired officers had to be specially requisitioned. The following officers were appointed to posts shown against them in connection with the above noted schemes :—

(1) Mr. D. B. Sothers, C.I.E. ..	Land Improvement Officer (General), Poona.
(2) Mr. B. S. Patel	Deputy Director of Agriculture, Dairy Farming, Bombay.
(3) Lt.-Col. A. W. Adams, O.B.E. ..	Liaison Officer and Business Manager, I/C Military Schemes run by the Agricultural Department, Poona.

(116) *Retirements.*—During the year under report, Dr. V. N. Gokhale, Officiating Soil Physicist to Government, Sholapur, retired from service from 1st April, 1944. Dr. Gokhale entered the subordinate agricultural service in February, 1919, in the Chemistry Section and during his service he officiated as Assistant Professor of Chemistry on several occasions and also as Agricultural Chemist. He worked as Assistant Investigator, Dry Farming Research Scheme, for about five years. He also worked as Chief Investigator, Dry Farming Research Scheme, for about a year. After the retirement of Mr. N. V. Kanitkar, he held this post until 30th June, 1943. During this period, he carried out the important work of writing up the results of the research work carried out at the Dry Farming Research Centre, Sholapur. From 1st July, 1943, he held the post of the Soil Physicist to Government till his retirement.

(117) *Obituary.*—During the year under report, the Agricultural Department suffered the grievous loss by death of four of its senior and experienced officers. Three of these officers were still in service at the time of their deaths.

(1) Mr. V. G. Gokhale, who retired from service as Principal of the Agricultural College, Poona, in March, 1938, spent most of his retirement in carrying out agricultural improvements on his private lands at Pashan near Poona. He was a very capable and enthusiastic officer who never spared himself in the discharge of his duties and his sad death, so shortly after retirement from active service, is much deplored by his colleagues and by the numerous students who passed through his hands.

(2) Mr. P. G. Dani, who died in March, 1944, while on duty as Assistant Horticulturist joined the Agricultural Department in October, 1919. During his service, he made a name for himself as a practical teacher in horticulture. He officiated as Horticulturist to Government, Bombay Province, Poona, on several occasions. He was much loved and respected by his colleagues and students and his untimely death deprives the Department of an able and energetic officer.

(3) Mr. K. V. Badekar held the officiating appointment of District Agricultural Officer, Poona, at the time of his sudden and premature death in June, 1944 which cut short a promising career. His loss is much regretted by his colleagues in the Department.

(4) Mr. C. A. Borudey was on deputation to the Jarila Cotton Seed Distribution Scheme in Khandesh as Agricultural Officer at the time of his death in June, 1944. His loss is much regretted by his co-workers in the Department.

B. FINANCE.

(118) *Departmental Expenditure and Receipts.*—The expenditure of the Agricultural Department for the year under report amounted to Rs. 54,59,422 as against Rs. 28,82,969 in the previous year. This considerable increase in expenditure is largely due to the expansion of departmental activities particularly the Land Improvement Section and to the more intensive working of the various schemes under the " Grow More Food " Campaign.

The receipts of the Department from all sources were Rs. 4,46,556 as against Rs. 3,45,370 in the previous year. This increase is due mainly to the general rise in the prices of the farm produce.

(119) *Subsidies and Grants.*—Undernoted subsidies and grants were received for extension and research work and the departmental activities during the year under report :—

	Rs.
(*a*) From the Imperial Council of Agricultural Research for various research schemes	81,114
(*b*) From the Indian Central Cotton Committee for research schemes and multiplication and distribution schemes, etc., dealing with the cotton crop	1,05,750
(*c*) From the Sugar Excise Fund of the Government of India for work on the improvement of sugarcane cultivation ..	27,429
(*d*) From the Trustees of the Sir Sassoon David Trust Fund for research schemes for agricultural development ..	15,050
(*e*) From the Government of India from the fund for the benefit of Cotton growers in furtherance of Food Production Campaign	1,58,722
(*f*) From the Government of India from the Central Revenues in furtherance of Food Production Campaign ..	2,79,643
Total ..	6,67,708

(120) *Personal Ledger Accounts.*—The undernoted items were placed at the disposal of the Director of Agriculture and various other officers of the Department during the year under report for financing seed distribution work, "Grow More Food" Campaign, potato supply scheme and livestock improvement work in the Province :—

	Rs.
(a) Personal Ledger Account of the Director of Agriculture for financing cotton seed distribution work	3,24,500
(b) Personal Ledger Account for "Grow More Food" Campaign at the disposal of the Divisional Deputy Directors of Agriculture and the Divisional Superintendent of Agriculture, Konkan Division	32,74,000
(c) Personal Ledger Account for Storage and Supply of Potatoes to Military Authorities at the disposal of the Plant Pathologist to Government	40,40,268
(d) Personal Ledger Account for purchase of Numbri seed potatoes from Simla for supply to potato-growers at the disposal of the Plant Pathologist to Government ..	6,50,000
(e) Personal Ledger Account for making advances to approved cultivators for the purchase of premium bulls and cows at the disposal of the Livestock Expert to Government	20,000
Total ..	83,08,768

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BOMBAY : PRINTED AT THE GOVERNMENT CENTRAL PRESS.